Benchmarking Models 3 - Informed Priors

March 18, 2022

## Introduction

Performs a Bayesian calculation with uninformed priors to estimate model 2 of

### Warnings (if applicable)

## Setup

### the needful

Load the relevant packages

Set global core settings, if applicable. Use global setting only if necessary, best to use as an inline setting to avoid over allocating system resources

## The models - table 3

These models build out table 3 which presents the results for the primary and secondary outcomes utilizing informed priors with 1. normal distributions and 2. Cauchy distributions.We follow the advice of Rachael Meager and incorporate disagreement in the literature and use 6 standard deviations and a mean = 0

### **Per Capita Monthly Consumption** - Primary Outcome

Load the Monthly per capita consumption model variables

#### *Normal Distribution*

**per capita consumption**: This is the basic benchmarking model utilizing the a global normal distribution with mean = 0 and 6 standard deviations.

Model Summery

summary(per\_cap\_consumption\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: consumption\_asinh | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + consumption\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + (1 | block) + (1 | vid)   
## Data: per\_cap\_consumption\_data (Number of observations: 1750)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.27 0.06 0.16 0.40 1.00 925 1840  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.38 0.03 0.32 0.44 1.00 1822 2416  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 8.51 0.18 8.16 8.87 1.00 4268  
## cost\_deviation 0.00 0.00 0.00 0.00 1.00 2799  
## treat\_any 0.11 0.08 -0.05 0.28 1.00 2023  
## treat\_GK -0.13 0.08 -0.30 0.03 1.00 2313  
## consumption\_asinh\_R1 0.18 0.01 0.16 0.21 1.00 6550  
## Lhh\_wealth\_asinh 0.02 0.01 0.01 0.03 1.00 8404  
## Lvill\_eligible\_ratio 0.16 0.33 -0.48 0.80 1.00 1889  
## Tail\_ESS  
## Intercept 3113  
## cost\_deviation 2941  
## treat\_any 2617  
## treat\_GK 3076  
## consumption\_asinh\_R1 3162  
## Lhh\_wealth\_asinh 2465  
## Lvill\_eligible\_ratio 2542  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 1.16 0.01 1.14 1.19 1.00 6660 2748  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(per\_cap\_consumption\_normal\_bayesmodel)

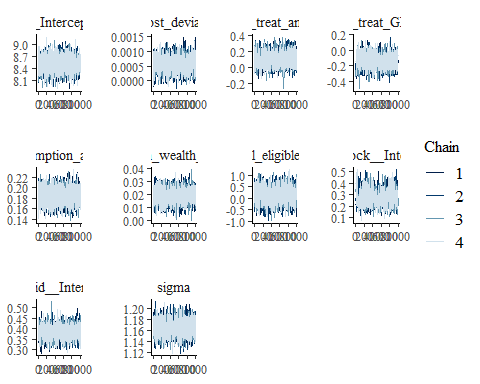
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b consumption\_asinh\_R1   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 10.7, 2.5) Intercept   
## student\_t(3, 0, 2.5) sd   
## student\_t(3, 0, 2.5) sd block   
## student\_t(3, 0, 2.5) sd Intercept block   
## student\_t(3, 0, 2.5) sd vid   
## student\_t(3, 0, 2.5) sd Intercept vid   
## student\_t(3, 0, 2.5) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(per\_cap\_consumption\_normal\_bayesmodel)

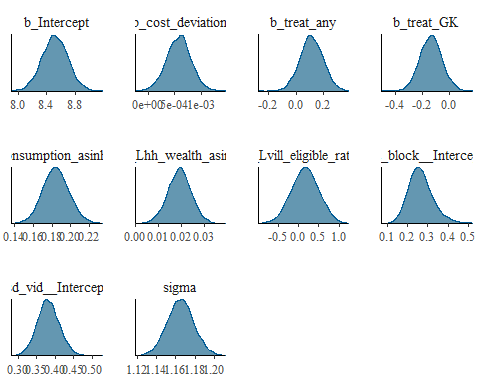
## Parameter Prior\_Quality  
## 1 b\_Intercept uninformative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_consumption\_asinh\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio uninformative

Diagnostics

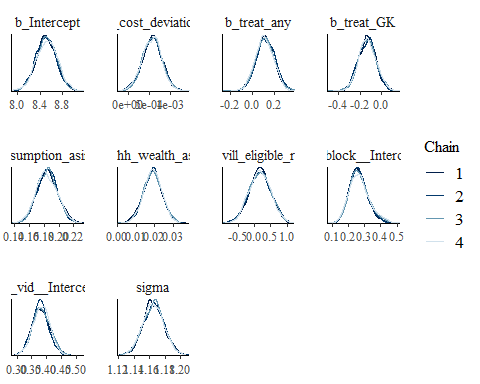
# trace diagnostic plot  
mcmc\_trace(per\_cap\_consumption\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_consumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))



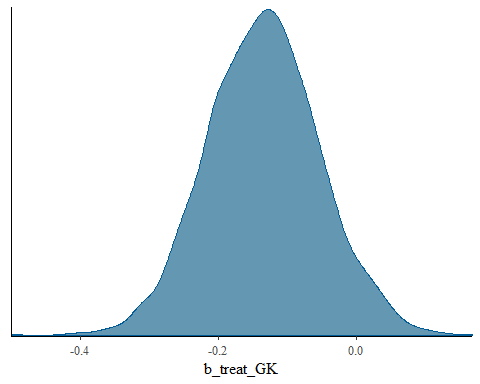
ggsave("table\_3\_diagnostics\\per\_cap\_consumption\_norm\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
  
#density diagnostic plot  
mcmc\_dens(per\_cap\_consumption\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_consumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))



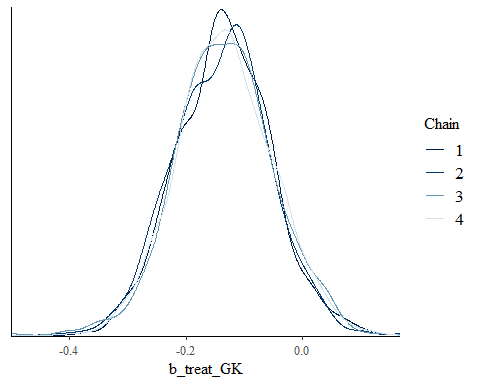
ggsave("table\_3\_diagnostics\\per\_cap\_consumption\_norm\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(per\_cap\_consumption\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_consumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))



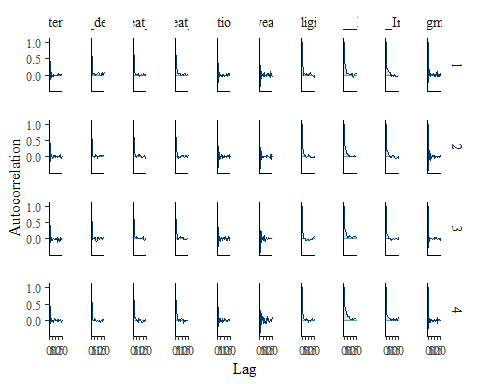
ggsave("table\_3\_diagnostics\\per\_cap\_consumption\_norm\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens(per\_cap\_consumption\_normal\_bayesmodel,pars = c("b\_treat\_GK"))



mcmc\_dens\_overlay(per\_cap\_consumption\_normal\_bayesmodel,pars = c("b\_treat\_GK"))



#acf (auto-correlation) diagnostic plot  
mcmc\_acf(per\_cap\_consumption\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_consumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))

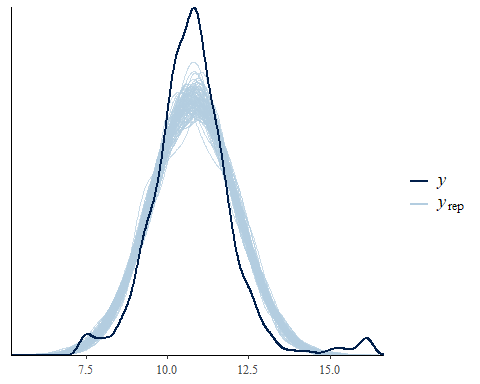


ggsave("table\_3\_diagnostics\\per\_cap\_consumption\_norm\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

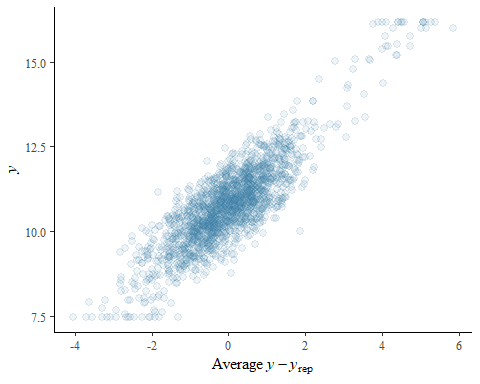
pp\_check(per\_cap\_consumption\_normal\_bayesmodel, nsamples = 100)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



pp\_check(per\_cap\_consumption\_normal\_bayesmodel, nsamples = 10, type = 'error\_scatter\_avg', alpha = .1)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



### **Dietary Diversity** - Primary Outcome

Load the **Dietary Diversity** variables

**Dietary Diversity:** This is the basic bechmarking model utilizing the default, uninformed priors

dietary\_diversity\_normal\_bayesmodel <-   
 brm(formula = dietarydiversity | weights(samp\_wgt) ~   
 cost\_deviation + treat\_any + treat\_GK +   
 dietarydiversity\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lsavingsstock\_asinh3 +   
 Lconsumpti\_x\_Ldietarydi + Lconsumpti\_x\_Lproductiv + Ldietarydi\_x\_Lassetscon +   
 (1 | vid) + (1 | block),  
 data = dietary\_diversity\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\dietary\_diversity\_normal\_bayes")

# tidy\_dietary\_diversity\_normal\_bayesmodel <- tidy(dietary\_diversity\_normal\_bayesmodel)  
# #view(tidy\_dietary\_diversity\_normal\_bayesmodel)  
# write\_csv(tidy\_dietary\_diversity\_normal\_bayesmodel, "informed\_prior\_outcomes\\dietary\_diversity\_normal\_bayes.csv")

Model Summary

summary(dietary\_diversity\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: dietarydiversity | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + dietarydiversity\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lsavingsstock\_asinh3 + Lconsumpti\_x\_Ldietarydi + Lconsumpti\_x\_Lproductiv + Ldietarydi\_x\_Lassetscon + (1 | vid) + (1 | block)   
## Data: dietary\_diversity\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.30 0.08 0.16 0.48 1.01 999 1490  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.55 0.04 0.47 0.64 1.00 1524 1977  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 3.19 0.22 2.75 3.62 1.00 3506  
## cost\_deviation 0.00 0.00 0.00 0.00 1.00 2913  
## treat\_any 0.25 0.12 0.02 0.48 1.00 2215  
## treat\_GK -0.03 0.11 -0.26 0.19 1.00 1985  
## dietarydiversity\_R1 -0.12 0.07 -0.27 0.02 1.00 3123  
## Lhh\_wealth\_asinh 0.01 0.01 -0.00 0.03 1.00 5196  
## Lvill\_eligible\_ratio -0.57 0.44 -1.46 0.30 1.00 1857  
## Lsavingsstock\_asinh3 0.00 0.00 0.00 0.00 1.00 4079  
## Lconsumpti\_x\_Ldietarydi 0.01 0.01 0.00 0.03 1.00 3153  
## Lconsumpti\_x\_Lproductiv 0.01 0.00 0.00 0.01 1.00 4034  
## Ldietarydi\_x\_Lassetscon 0.01 0.00 0.01 0.01 1.00 4947  
## Tail\_ESS  
## Intercept 2970  
## cost\_deviation 2827  
## treat\_any 2894  
## treat\_GK 2504  
## dietarydiversity\_R1 2880  
## Lhh\_wealth\_asinh 2539  
## Lvill\_eligible\_ratio 2270  
## Lsavingsstock\_asinh3 3187  
## Lconsumpti\_x\_Ldietarydi 2679  
## Lconsumpti\_x\_Lproductiv 3445  
## Ldietarydi\_x\_Lassetscon 3143  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 1.58 0.02 1.55 1.62 1.00 5780 3160  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(dietary\_diversity\_normal\_bayesmodel)

## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b dietarydiversity\_R1   
## normal(0,6) b Lconsumpti\_x\_Ldietarydi   
## normal(0,6) b Lconsumpti\_x\_Lproductiv   
## normal(0,6) b Ldietarydi\_x\_Lassetscon   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lsavingsstock\_asinh3   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 5, 2.5) Intercept   
## student\_t(3, 0, 2.5) sd   
## student\_t(3, 0, 2.5) sd block   
## student\_t(3, 0, 2.5) sd Intercept block   
## student\_t(3, 0, 2.5) sd vid   
## student\_t(3, 0, 2.5) sd Intercept vid   
## student\_t(3, 0, 2.5) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(dietary\_diversity\_normal\_bayesmodel)

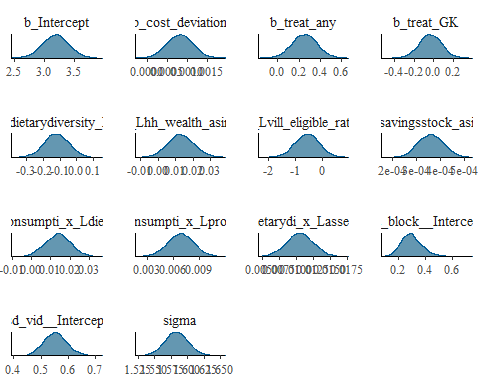
## Parameter Prior\_Quality  
## 1 b\_Intercept uninformative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_dietarydiversity\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio uninformative  
## 8 b\_Lsavingsstock\_asinh3 uninformative  
## 9 b\_Lconsumpti\_x\_Ldietarydi uninformative  
## 10 b\_Lconsumpti\_x\_Lproductiv uninformative  
## 11 b\_Ldietarydi\_x\_Lassetscon uninformative

Diagnostics

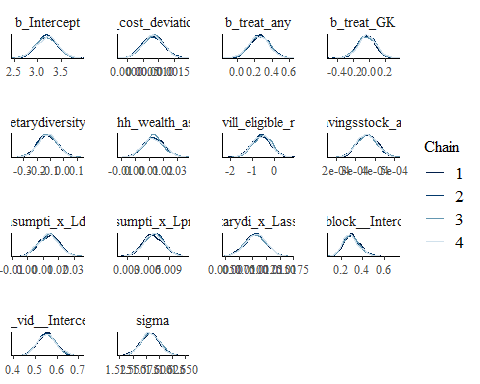
# trace diagnostic plot  
mcmc\_trace(dietary\_diversity\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_dietarydiversity\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "b\_Lsavingsstock\_asinh3",  
 "b\_Lconsumpti\_x\_Ldietarydi", "b\_Lconsumpti\_x\_Lproductiv",   
 "b\_Ldietarydi\_x\_Lassetscon", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))



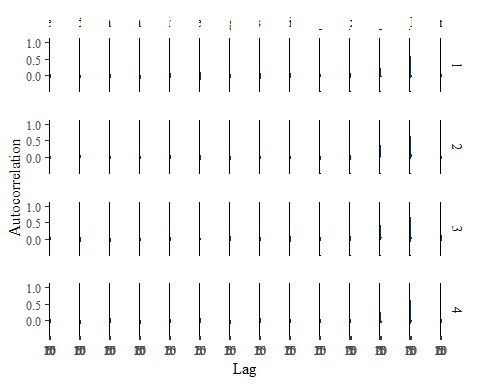
ggsave("table\_3\_diagnostics\\dietary\_div\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plot  
mcmc\_dens(dietary\_diversity\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_dietarydiversity\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "b\_Lsavingsstock\_asinh3",  
 "b\_Lconsumpti\_x\_Ldietarydi", "b\_Lconsumpti\_x\_Lproductiv",   
 "b\_Ldietarydi\_x\_Lassetscon", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\dietary\_div\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(dietary\_diversity\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_dietarydiversity\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "b\_Lsavingsstock\_asinh3",  
 "b\_Lconsumpti\_x\_Ldietarydi", "b\_Lconsumpti\_x\_Lproductiv",   
 "b\_Ldietarydi\_x\_Lassetscon", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\dietary\_div\_normal\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(dietary\_diversity\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_dietarydiversity\_R1", "b\_Lhh\_wealth\_asinh",  
 "b\_Lvill\_eligible\_ratio", "b\_Lsavingsstock\_asinh3",  
 "b\_Lconsumpti\_x\_Ldietarydi", "b\_Lconsumpti\_x\_Lproductiv",   
 "b\_Ldietarydi\_x\_Lassetscon", "sd\_block\_\_Intercept",   
 "sd\_vid\_\_Intercept", "sigma"))

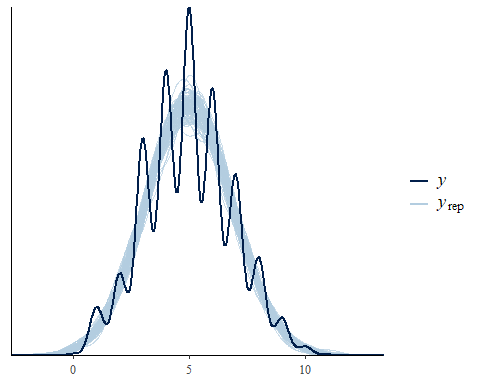


ggsave("table\_3\_diagnostics\\dietary\_div\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

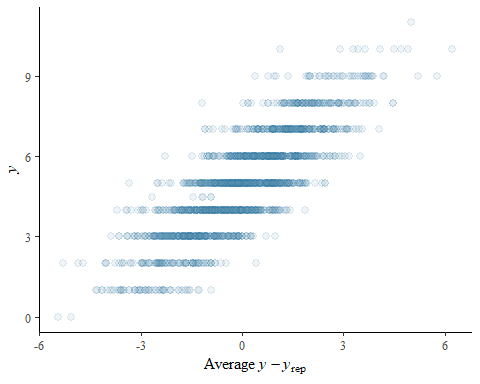
pp\_check(dietary\_diversity\_normal\_bayesmodel, nsamples = 100)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



pp\_check(dietary\_diversity\_normal\_bayesmodel, nsamples = 10, type = 'error\_scatter\_avg', alpha = .1)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



### **Total Household Wealth** - Primary Outcome

Load the **total household wealth** model variables

**total household wealth**: This is the basic benchmarking model utilizing brm() default, uninformed priors. Removed Lhh\_wealth\_asinh to account for collinearity issues.

hh\_wealth\_normal\_bayesmodel <-  
 brm(formula = wealth\_asinh | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 wealth\_asinh\_R1 + Lvill\_eligible\_ratio + Lowndwelling +  
 (1 | block) + (1 | vid),  
 data = hh\_wealth\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .99, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\hh\_wealth\_normal\_bayes")

Model Summery

summary(hh\_wealth\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: wealth\_asinh | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + wealth\_asinh\_R1 + Lvill\_eligible\_ratio + Lowndwelling + (1 | block) + (1 | vid)   
## Data: hh\_wealth\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.52 0.15 0.24 0.84 1.00 838 1059  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 1.03 0.09 0.85 1.22 1.00 1546 2483  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 7.81 0.32 7.18 8.42 1.00 3221  
## cost\_deviation 0.00 0.00 -0.00 0.00 1.00 3080  
## treat\_any 0.06 0.23 -0.40 0.52 1.00 2187  
## treat\_GK 0.01 0.23 -0.43 0.47 1.00 2311  
## wealth\_asinh\_R1 0.18 0.02 0.15 0.21 1.00 5499  
## Lvill\_eligible\_ratio -0.10 0.84 -1.79 1.49 1.00 1882  
## Lowndwelling 3.46 0.20 3.07 3.86 1.00 5247  
## Tail\_ESS  
## Intercept 3327  
## cost\_deviation 3530  
## treat\_any 2541  
## treat\_GK 2728  
## wealth\_asinh\_R1 3585  
## Lvill\_eligible\_ratio 2751  
## Lowndwelling 3514  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 3.43 0.04 3.35 3.51 1.00 6564 2972  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(hh\_wealth\_normal\_bayesmodel)

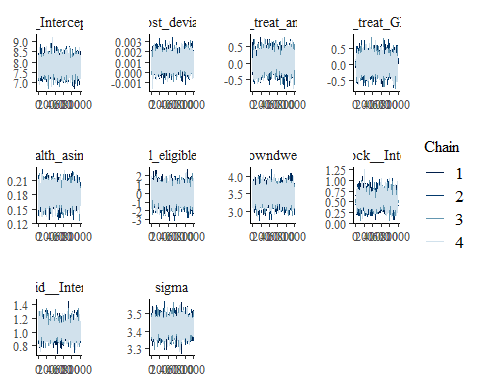
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Lowndwelling   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## normal(0,6) b wealth\_asinh\_R1   
## student\_t(3, 13.9, 2.5) Intercept   
## student\_t(3, 0, 2.5) sd   
## student\_t(3, 0, 2.5) sd block   
## student\_t(3, 0, 2.5) sd Intercept block   
## student\_t(3, 0, 2.5) sd vid   
## student\_t(3, 0, 2.5) sd Intercept vid   
## student\_t(3, 0, 2.5) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(hh\_wealth\_normal\_bayesmodel)

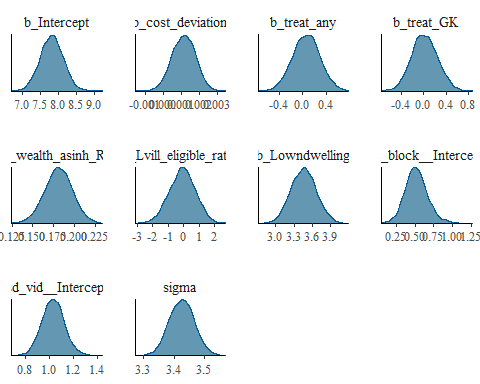
## Parameter Prior\_Quality  
## 1 b\_Intercept uninformative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_wealth\_asinh\_R1 uninformative  
## 6 b\_Lvill\_eligible\_ratio informative  
## 7 b\_Lowndwelling uninformative

Diagnostics

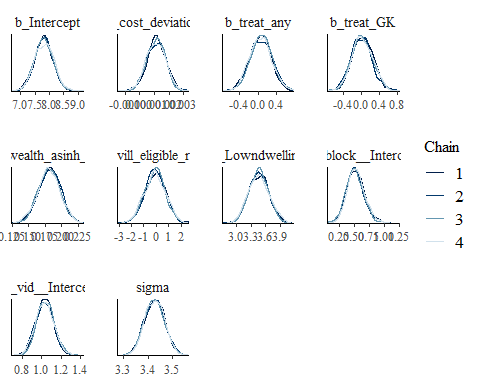
# trace diagnostic plot  
mcmc\_trace(hh\_wealth\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_wealth\_asinh\_R1",  
 "b\_Lvill\_eligible\_ratio", "b\_Lowndwelling",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



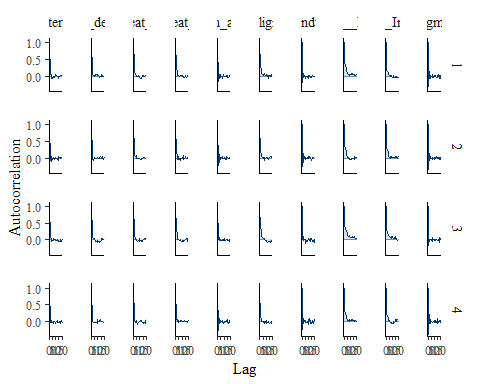
ggsave("table\_3\_diagnostics\\hh\_wealth\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plot  
mcmc\_dens(hh\_wealth\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_wealth\_asinh\_R1",  
 "b\_Lvill\_eligible\_ratio", "b\_Lowndwelling",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\hh\_wealth\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(hh\_wealth\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_wealth\_asinh\_R1",  
 "b\_Lvill\_eligible\_ratio", "b\_Lowndwelling",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\hh\_wealth\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(hh\_wealth\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any",   
 "b\_treat\_GK", "b\_wealth\_asinh\_R1",  
 "b\_Lvill\_eligible\_ratio", "b\_Lowndwelling",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))

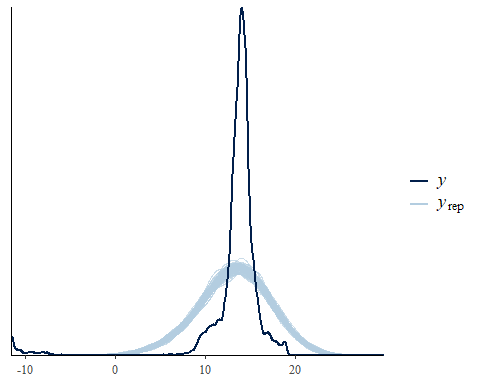


ggsave("table\_3\_diagnostics\\hh\_wealth\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

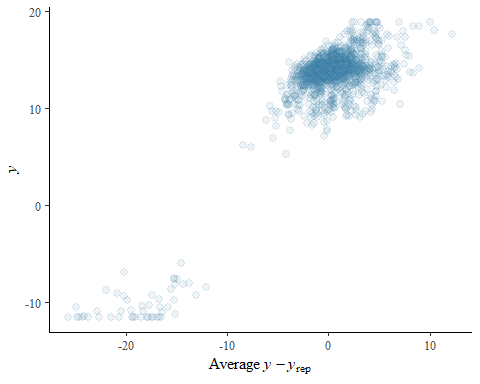
pp\_check(hh\_wealth\_normal\_bayesmodel, nsamples = 100)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



pp\_check(hh\_wealth\_normal\_bayesmodel, nsamples = 10, type = 'error\_scatter\_avg', alpha = .1)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



### **Borrowing Stock** - Secondary Outcome

Load the **borrowing stock** model variables

**borrowing stock**: This is the basic benchmarking model utilizing brm() global weakly informed priors with mean = 0 and 6 standard deviations.

borrowing\_stock\_normal\_bayesmodel <-  
 brm(formula = borrowingstock\_asinh | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 borrowingstock\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio +  
 (1 | block) + (1 | vid),  
 data = borrowing\_stock\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\borrowing\_stock\_normal\_bayes")

Model Summery

summary(borrowing\_stock\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: borrowingstock\_asinh | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + borrowingstock\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + (1 | block) + (1 | vid)   
## Data: borrowing\_stock\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.93 0.20 0.58 1.37 1.00 1115 1692  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 1.19 0.11 0.99 1.41 1.00 1551 2673  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 6.13 0.43 5.28 6.97 1.00 2114  
## cost\_deviation 0.00 0.00 -0.00 0.00 1.00 3212  
## treat\_any -0.73 0.28 -1.28 -0.19 1.00 2114  
## treat\_GK 0.67 0.28 0.13 1.23 1.00 1993  
## borrowingstock\_asinh\_R1 0.23 0.02 0.20 0.26 1.00 4909  
## Lhh\_wealth\_asinh -0.00 0.02 -0.04 0.03 1.00 4630  
## Lvill\_eligible\_ratio -0.50 1.08 -2.56 1.69 1.00 1775  
## Tail\_ESS  
## Intercept 2566  
## cost\_deviation 3023  
## treat\_any 2525  
## treat\_GK 2440  
## borrowingstock\_asinh\_R1 3375  
## Lhh\_wealth\_asinh 3116  
## Lvill\_eligible\_ratio 2416  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 4.48 0.05 4.38 4.59 1.00 6601 2872  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(borrowing\_stock\_normal\_bayesmodel)

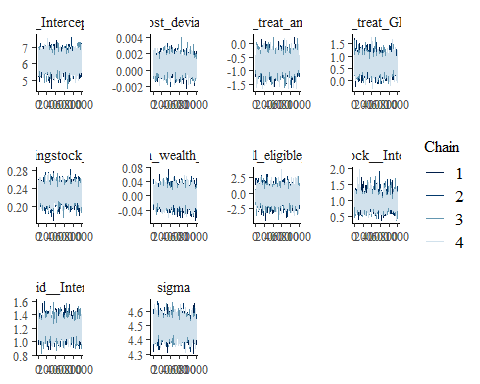
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b borrowingstock\_asinh\_R1   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 9.2, 2.9) Intercept   
## student\_t(3, 0, 2.9) sd   
## student\_t(3, 0, 2.9) sd block   
## student\_t(3, 0, 2.9) sd Intercept block   
## student\_t(3, 0, 2.9) sd vid   
## student\_t(3, 0, 2.9) sd Intercept vid   
## student\_t(3, 0, 2.9) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(borrowing\_stock\_normal\_bayesmodel)

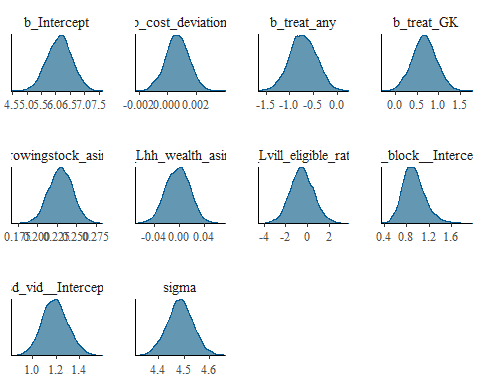
## Parameter Prior\_Quality  
## 1 b\_Intercept uninformative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_borrowingstock\_asinh\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio informative

Diagnostics

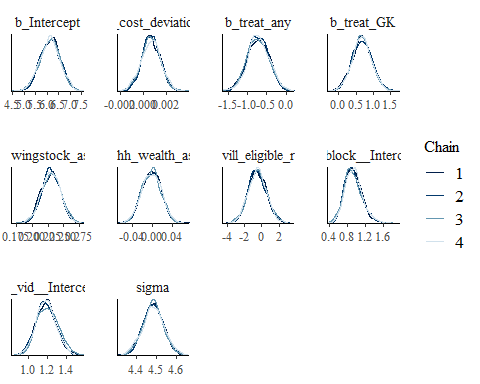
# trace diagnostic plot  
mcmc\_trace(borrowing\_stock\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_borrowingstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



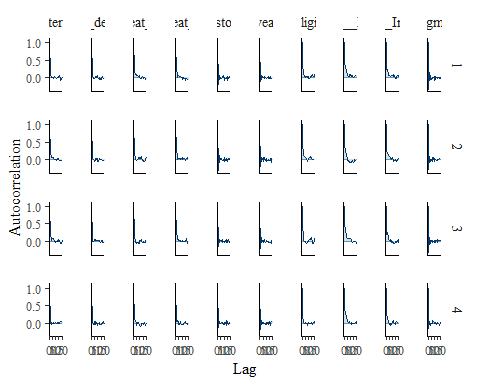
ggsave("table\_3\_diagnostics\\borrowing\_stock\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(borrowing\_stock\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_borrowingstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\borrowing\_stock\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(borrowing\_stock\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_borrowingstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\borrowing\_stock\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(borrowing\_stock\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_borrowingstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))

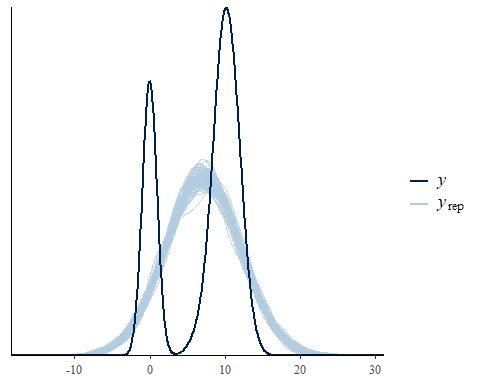


ggsave("table\_3\_diagnostics\\borrowing\_stock\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

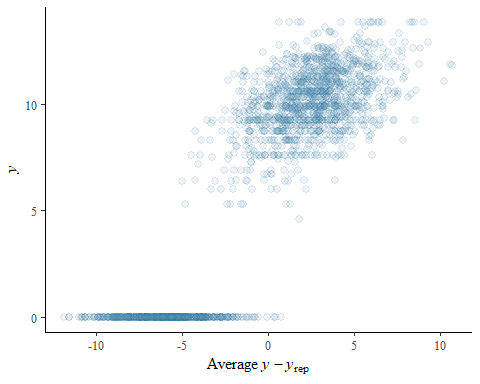
pp\_check(borrowing\_stock\_normal\_bayesmodel, nsamples = 100)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



pp\_check(borrowing\_stock\_normal\_bayesmodel, nsamples = 10, type = 'error\_scatter\_avg', alpha = .1)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



### **Savings Stock** - Secondary Outcome

Load the **savings stock** model variables

**savings stock**: This is the basic bechmarking model utilzing brm() default uninformed priors

savings\_stock\_normal\_bayesmodel <-  
 brm(formula = savingsstock\_asinh | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 savingsstock\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio +   
 Lconsumpti\_x\_Lproductiv + Lconsumpti\_x\_Lassetscon +  
 (1 | block) + (1 | vid),  
 data = savings\_stock\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\savings\_stock\_normal\_bayes")

Model Summery

summary(savings\_stock\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: savingsstock\_asinh | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + savingsstock\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lconsumpti\_x\_Lproductiv + Lconsumpti\_x\_Lassetscon + (1 | block) + (1 | vid)   
## Data: savings\_stock\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.70 0.19 0.36 1.12 1.00 840 1205  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 1.40 0.11 1.18 1.63 1.01 1074 1983  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 1.78 0.46 0.88 2.68 1.00 2347  
## cost\_deviation 0.00 0.00 -0.00 0.00 1.00 2022  
## treat\_any -0.13 0.30 -0.73 0.48 1.00 1409  
## treat\_GK 1.31 0.30 0.73 1.92 1.00 1287  
## savingsstock\_asinh\_R1 0.17 0.01 0.14 0.20 1.00 4002  
## Lhh\_wealth\_asinh -0.05 0.02 -0.09 -0.02 1.00 4623  
## Lvill\_eligible\_ratio 1.54 1.17 -0.68 3.89 1.00 1232  
## Lconsumpti\_x\_Lproductiv 0.02 0.00 0.02 0.03 1.00 5177  
## Lconsumpti\_x\_Lassetscon 0.01 0.00 0.01 0.01 1.00 5780  
## Tail\_ESS  
## Intercept 3166  
## cost\_deviation 2700  
## treat\_any 1854  
## treat\_GK 2084  
## savingsstock\_asinh\_R1 2628  
## Lhh\_wealth\_asinh 3062  
## Lvill\_eligible\_ratio 1905  
## Lconsumpti\_x\_Lproductiv 3323  
## Lconsumpti\_x\_Lassetscon 3550  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 4.15 0.05 4.06 4.25 1.00 5102 3097  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(savings\_stock\_normal\_bayesmodel)

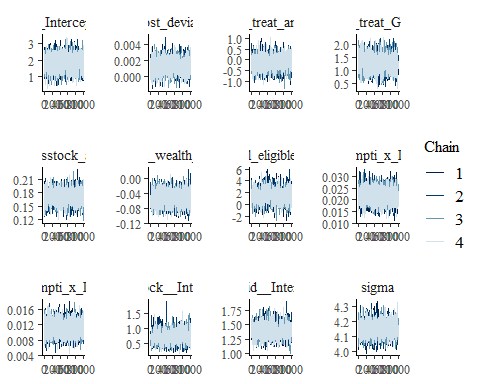
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Lconsumpti\_x\_Lassetscon   
## normal(0,6) b Lconsumpti\_x\_Lproductiv   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b savingsstock\_asinh\_R1   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 8.7, 3.1) Intercept   
## student\_t(3, 0, 3.1) sd   
## student\_t(3, 0, 3.1) sd block   
## student\_t(3, 0, 3.1) sd Intercept block   
## student\_t(3, 0, 3.1) sd vid   
## student\_t(3, 0, 3.1) sd Intercept vid   
## student\_t(3, 0, 3.1) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(savings\_stock\_normal\_bayesmodel)

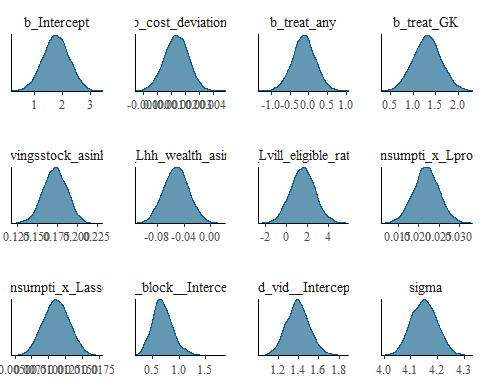
## Parameter Prior\_Quality  
## 1 b\_Intercept uninformative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_savingsstock\_asinh\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio informative  
## 8 b\_Lconsumpti\_x\_Lproductiv uninformative  
## 9 b\_Lconsumpti\_x\_Lassetscon uninformative

Diagnostics

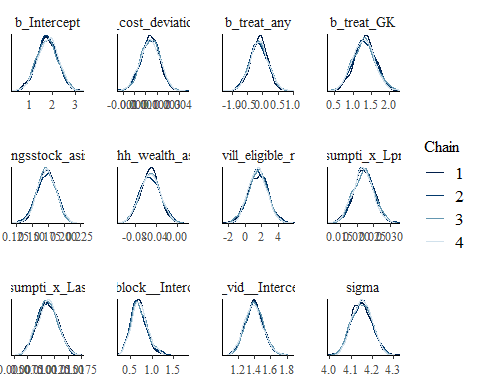
# trace diagnostic plot  
mcmc\_trace(savings\_stock\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_savingsstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lproductiv", "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



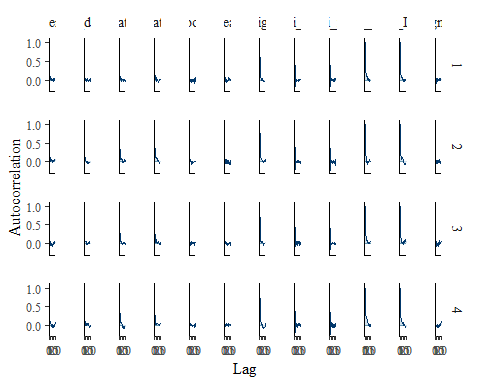
ggsave("table\_3\_diagnostics\\savings\_stock\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(savings\_stock\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_savingsstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lproductiv", "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\savings\_stock\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(savings\_stock\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_savingsstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lproductiv", "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\savings\_stock\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(savings\_stock\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_savingsstock\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lproductiv", "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))

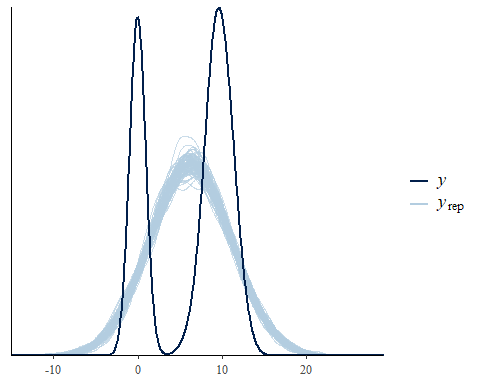


ggsave("table\_3\_diagnostics\\savings\_stock\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

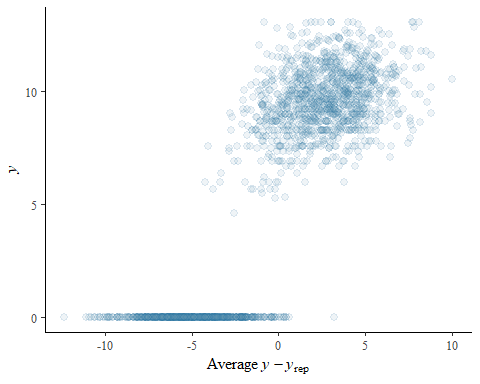
pp\_check(savings\_stock\_normal\_bayesmodel, nsamples = 100)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



pp\_check(savings\_stock\_normal\_bayesmodel, nsamples = 10, type = 'error\_scatter\_avg', alpha = .1)

## Warning: Argument 'nsamples' is deprecated. Please use argument 'ndraws'  
## instead.



### **Health Knowledge** - Secondary Outcome

Load the **health knowledge** model variables

**health knowledge**: This is the basic bechmarking model utilzing brm() default, uninformed priors

health\_knowledge\_normal\_bayesmodel <-  
 brm(formula = health\_knowledge | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 health\_knowledge\_R1 +   
 Lhh\_wealth\_asinh + Lvill\_eligible\_ratio +  
 (1 | block) + (1 | vid),  
 data = health\_knowledge\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\health\_knowledge\_normal\_bayes")

Model Summery

summary(health\_knowledge\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: health\_knowledge | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + health\_knowledge\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + (1 | block) + (1 | vid)   
## Data: health\_knowledge\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.34 0.22 0.02 0.81 1.00 454 1098  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 1.64 0.12 1.42 1.88 1.00 1474 2879  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 1.37 0.40 0.60 2.17 1.00 2668  
## cost\_deviation 0.00 0.00 -0.00 0.00 1.00 2071  
## treat\_any 0.10 0.33 -0.54 0.76 1.00 1447  
## treat\_GK -0.08 0.34 -0.76 0.60 1.00 1364  
## health\_knowledge\_R1 0.06 0.02 0.03 0.09 1.00 4833  
## Lhh\_wealth\_asinh 0.11 0.02 0.07 0.15 1.00 5603  
## Lvill\_eligible\_ratio 0.61 1.15 -1.66 2.89 1.00 1349  
## Tail\_ESS  
## Intercept 2726  
## cost\_deviation 2465  
## treat\_any 2351  
## treat\_GK 2339  
## health\_knowledge\_R1 2690  
## Lhh\_wealth\_asinh 2820  
## Lvill\_eligible\_ratio 1861  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 4.35 0.05 4.25 4.45 1.00 4968 2742  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(health\_knowledge\_normal\_bayesmodel)

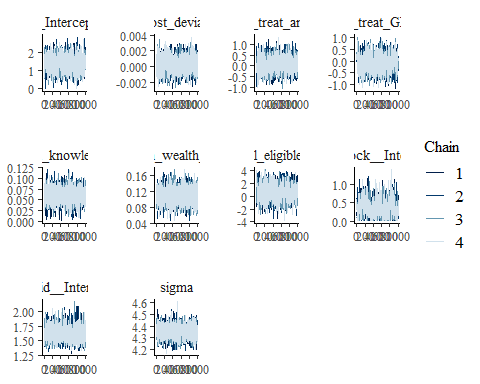
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b health\_knowledge\_R1   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 3.2, 3.8) Intercept   
## student\_t(3, 0, 3.8) sd   
## student\_t(3, 0, 3.8) sd block   
## student\_t(3, 0, 3.8) sd Intercept block   
## student\_t(3, 0, 3.8) sd vid   
## student\_t(3, 0, 3.8) sd Intercept vid   
## student\_t(3, 0, 3.8) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(health\_knowledge\_normal\_bayesmodel)

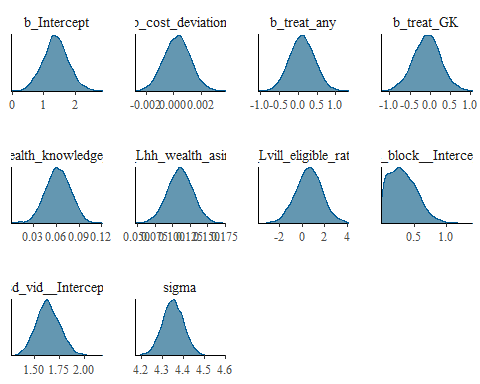
## Parameter Prior\_Quality  
## 1 b\_Intercept informative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_health\_knowledge\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio informative

Diagnostics

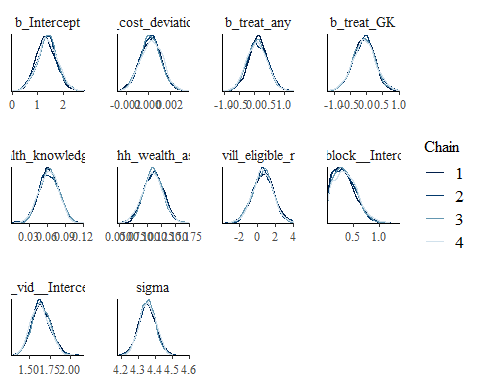
# trace diagnostic plot  
mcmc\_trace(health\_knowledge\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_health\_knowledge\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



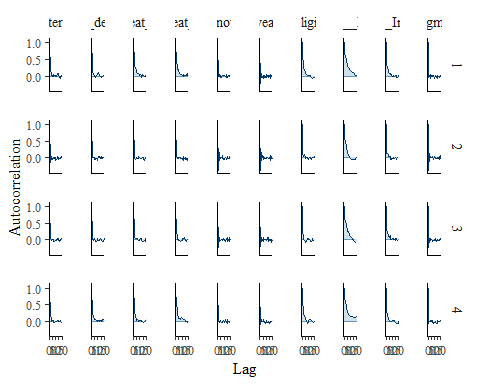
ggsave("table\_3\_diagnostics\\health\_knowledge\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(health\_knowledge\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_health\_knowledge\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\health\_knowledge\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(health\_knowledge\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_health\_knowledge\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



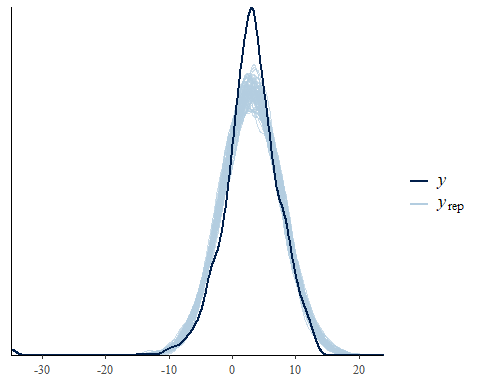
ggsave("table\_3\_diagnostics\\health\_knowledge\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(health\_knowledge\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_health\_knowledge\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



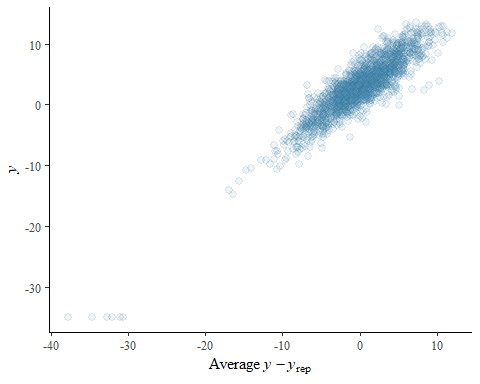
ggsave("table\_3\_diagnostics\\health\_knowledge\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

pp\_check(health\_knowledge\_normal\_bayesmodel, ndraws = 100)



pp\_check(health\_knowledge\_normal\_bayesmodel, ndraws = 10, type = 'error\_scatter\_avg', alpha = .1)



### **sanitation practices** - Secondary Outcome

Load the **sanitation practices** model variables

**sanitation practices**: This is the basic benchmarking model utilizing the default, uninformed priors

sanitation\_practices\_normal\_bayesmodel <-  
 brm(formula = sanitation\_practices | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 sanitation\_practices\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio +  
 Lproductiv\_x\_Lassetscon +  
 (1 | block) + (1 | vid),  
 data = sanitation\_practices\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\sanitation\_practices\_normal\_bayes")

Model Summery

summary(sanitation\_practices\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: sanitation\_practices | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + sanitation\_practices\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lproductiv\_x\_Lassetscon + (1 | block) + (1 | vid)   
## Data: sanitation\_practices\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.18 0.12 0.01 0.44 1.00 695 1527  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.97 0.07 0.84 1.10 1.00 1975 3150  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept -2.01 0.24 -2.49 -1.54 1.00 2838  
## cost\_deviation 0.00 0.00 -0.00 0.00 1.00 2594  
## treat\_any 0.21 0.20 -0.18 0.61 1.00 1824  
## treat\_GK -0.31 0.20 -0.70 0.09 1.00 1809  
## sanitation\_practices\_R1 0.11 0.02 0.07 0.14 1.00 6618  
## Lhh\_wealth\_asinh 0.04 0.01 0.01 0.06 1.00 8011  
## Lvill\_eligible\_ratio 0.03 0.69 -1.32 1.41 1.00 1698  
## Lproductiv\_x\_Lassetscon 0.01 0.00 0.01 0.01 1.00 5045  
## Tail\_ESS  
## Intercept 3352  
## cost\_deviation 2614  
## treat\_any 2550  
## treat\_GK 2471  
## sanitation\_practices\_R1 3076  
## Lhh\_wealth\_asinh 3119  
## Lvill\_eligible\_ratio 2384  
## Lproductiv\_x\_Lassetscon 3458  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 2.63 0.03 2.57 2.69 1.00 7096 2932  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(sanitation\_practices\_normal\_bayesmodel)

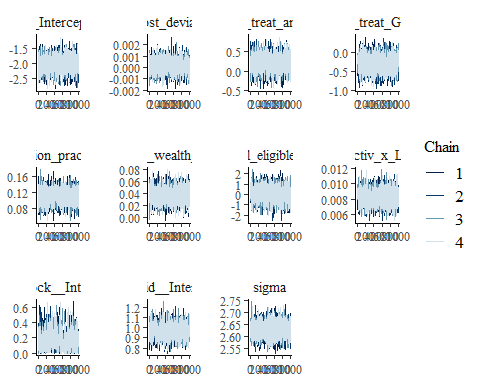
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lproductiv\_x\_Lassetscon   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b sanitation\_practices\_R1   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 0.1, 3) Intercept   
## student\_t(3, 0, 3) sd   
## student\_t(3, 0, 3) sd block   
## student\_t(3, 0, 3) sd Intercept block   
## student\_t(3, 0, 3) sd vid   
## student\_t(3, 0, 3) sd Intercept vid   
## student\_t(3, 0, 3) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(sanitation\_practices\_normal\_bayesmodel)

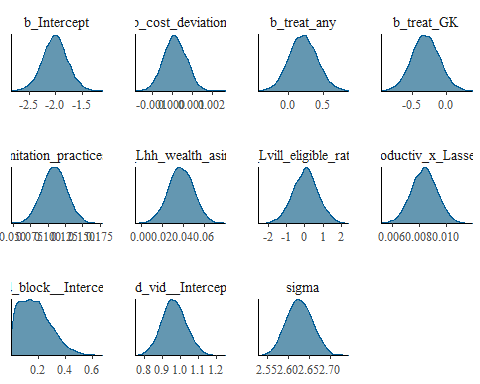
## Parameter Prior\_Quality  
## 1 b\_Intercept informative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_sanitation\_practices\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio informative  
## 8 b\_Lproductiv\_x\_Lassetscon uninformative

Diagnostics

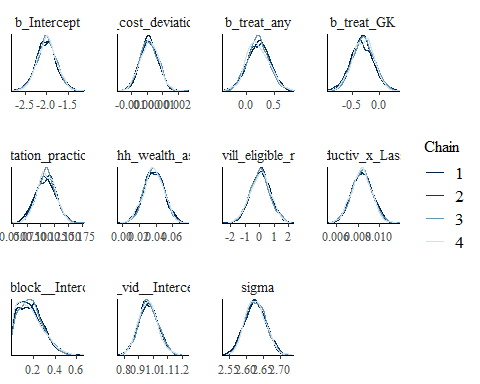
# trace diagnostic plot  
mcmc\_trace(sanitation\_practices\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_sanitation\_practices\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



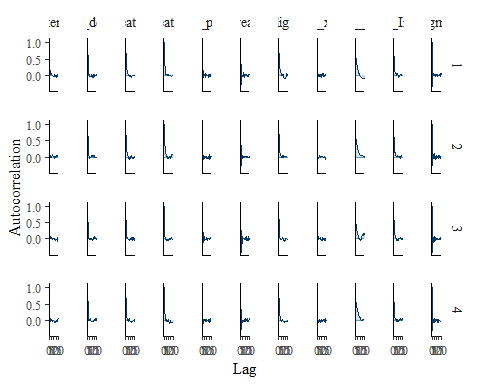
ggsave("table\_3\_diagnostics\\sanitation\_practices\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(sanitation\_practices\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_sanitation\_practices\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\sanitation\_practices\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(sanitation\_practices\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_sanitation\_practices\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



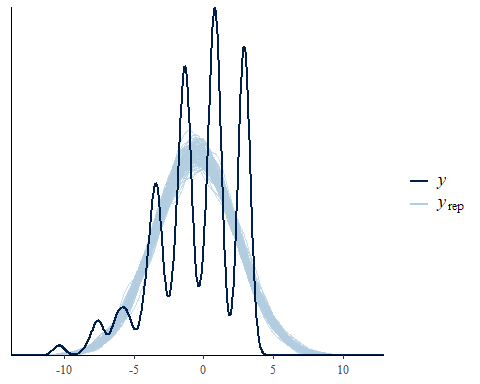
ggsave("table\_3\_diagnostics\\sanitation\_practices\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(sanitation\_practices\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_sanitation\_practices\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



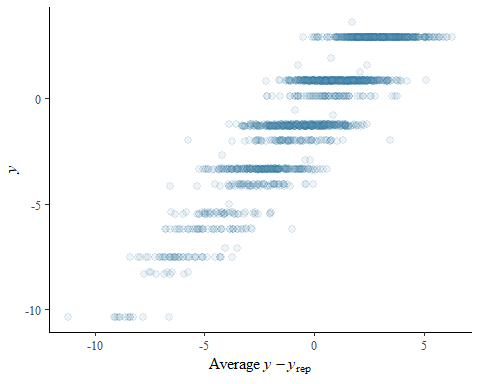
ggsave("table\_3\_diagnostics\\sanitation\_practices\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

pp\_check(sanitation\_practices\_normal\_bayesmodel, ndraws = 100)



pp\_check(sanitation\_practices\_normal\_bayesmodel, ndraws = 10, type = 'error\_scatter\_avg', alpha = .1)



### **productive assets** - Secondary Outcome

Load the **productive assets** model variables

**productive assets**: This is the basic benchmarking model utilizing the default, uninformed priors

productive\_assets\_normal\_bayesmodel <-  
 brm(formula = productiveassets\_asinh | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 productiveassets\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio +  
 Lconsumpti\_x\_Lassetscon +  
 (1 | block) + (1 | vid),  
 data = productive\_assets\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\productive\_assets\_normal\_bayes")

Model Summery

summary(productive\_assets\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: productiveassets\_asinh | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + productiveassets\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lconsumpti\_x\_Lassetscon + (1 | block) + (1 | vid)   
## Data: productive\_assets\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.34 0.07 0.22 0.50 1.00 1918 2377  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.43 0.04 0.36 0.51 1.00 1525 2705  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 6.89 0.21 6.48 7.31 1.00 4710  
## cost\_deviation 0.00 0.00 0.00 0.00 1.00 4761  
## treat\_any 0.37 0.10 0.18 0.57 1.00 3640  
## treat\_GK -0.27 0.10 -0.46 -0.07 1.00 3640  
## productiveassets\_asinh\_R1 0.33 0.02 0.30 0.37 1.00 9267  
## Lhh\_wealth\_asinh -0.00 0.01 -0.01 0.01 1.00 8694  
## Lvill\_eligible\_ratio 0.12 0.40 -0.67 0.88 1.00 3211  
## Lconsumpti\_x\_Lassetscon 0.01 0.00 0.00 0.01 1.00 4417  
## Tail\_ESS  
## Intercept 3456  
## cost\_deviation 3691  
## treat\_any 3388  
## treat\_GK 3483  
## productiveassets\_asinh\_R1 3190  
## Lhh\_wealth\_asinh 3238  
## Lvill\_eligible\_ratio 3084  
## Lconsumpti\_x\_Lassetscon 3279  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 1.50 0.02 1.47 1.53 1.00 7656 3088  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(productive\_assets\_normal\_bayesmodel)

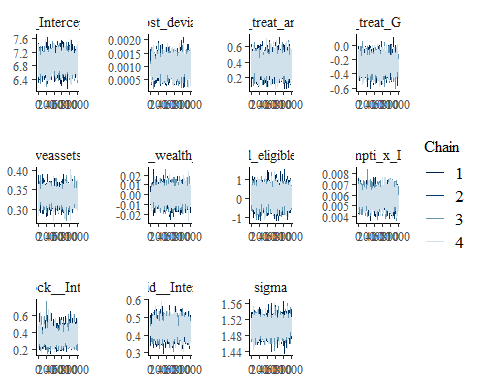
## prior class coef group resp dpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Lconsumpti\_x\_Lassetscon   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b productiveassets\_asinh\_R1   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 11.4, 2.5) Intercept   
## student\_t(3, 0, 2.5) sd   
## student\_t(3, 0, 2.5) sd block   
## student\_t(3, 0, 2.5) sd Intercept block   
## student\_t(3, 0, 2.5) sd vid   
## student\_t(3, 0, 2.5) sd Intercept vid   
## student\_t(3, 0, 2.5) sigma   
## nlpar bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(productive\_assets\_normal\_bayesmodel)

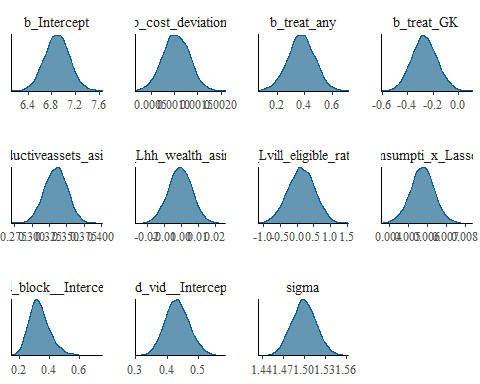
## Parameter Prior\_Quality  
## 1 b\_Intercept uninformative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_productiveassets\_asinh\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio uninformative  
## 8 b\_Lconsumpti\_x\_Lassetscon uninformative

Diagnostics

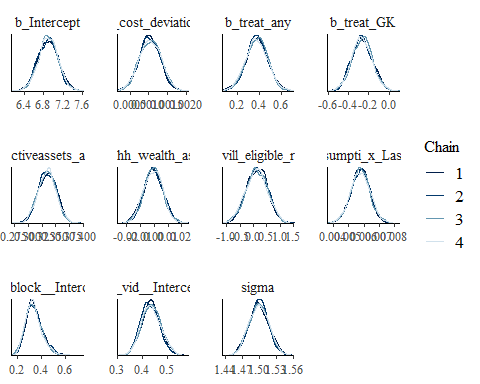
# trace diagnostic plot  
mcmc\_trace(productive\_assets\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_productiveassets\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



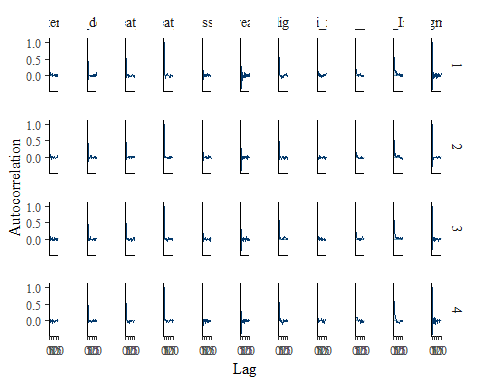
ggsave("table\_3\_diagnostics\\productive\_assets\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(productive\_assets\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_productiveassets\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\productive\_assets\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(productive\_assets\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_productiveassets\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



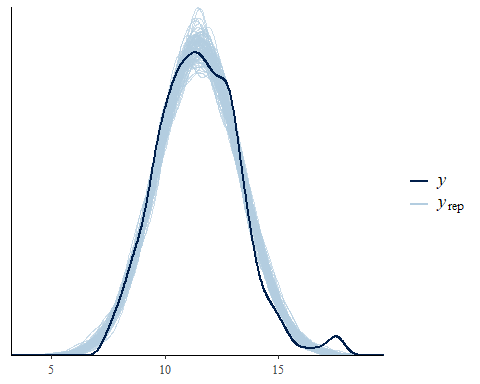
ggsave("table\_3\_diagnostics\\productive\_assets\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(productive\_assets\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_productiveassets\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",  
 "b\_Lconsumpti\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



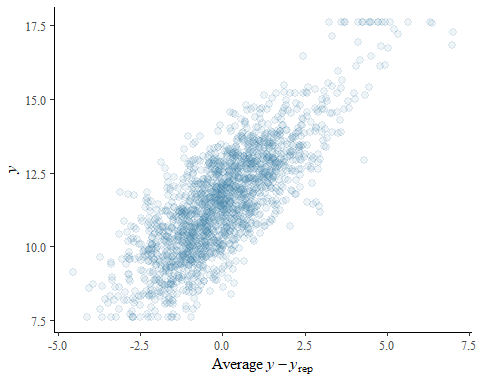
ggsave("table\_3\_diagnostics\\productive\_assets\_normal\_cf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

pp\_check(productive\_assets\_normal\_bayesmodel, ndraws = 100)



pp\_check(productive\_assets\_normal\_bayesmodel, ndraws = 10, type = 'error\_scatter\_avg', alpha = .1)



### **Consumption Assets** - Secondary Outcome

Load the **consumption assets** model variables

**consumption assets**: This is the basic benchmarking model utilizing a global normal prior with mean = and 6 standard deviations. This model has a number of errors: Warning:

* There were 4 chains where the estimated Bayesian Fraction of Missing Information was low. See <https://mc-stan.org/misc/warnings.html#bfmi-low>
* Warning: Examine the pairs() plot to diagnose sampling problems
* Warning: The largest R-hat is 4.48, indicating chains have not mixed. Running the chains for more iterations may help. See <https://mc-stan.org/misc/warnings.html#r-hat>
* Warning: Bulk Effective Samples Size (ESS) is too low, indicating posterior means and medians may be unreliable.
* Warning: Tail Effective Samples Size (ESS) is too low, indicating posterior variances and tail quantiles may be unreliable. <https://mc-stan.org/misc/warnings.html#tail-ess>

consumption\_assets\_normal\_bayesmodel <-  
 brm(formula = assetsconsumption\_asinh | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 assetsconsumption\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lroomsnumb + Ldurablesexpenditure +  
 Ldietarydi\_x\_Lassetscon + Lproductiv\_x\_Lassetscon +  
 (1 | block) + (1 | vid),  
 data = consumption\_assets\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\consumption\_assets\_normal\_bayes")

Model Summery

summary(consumption\_assets\_normal\_bayesmodel)

## Warning: Parts of the model have not converged (some Rhats are > 1.05). Be  
## careful when analysing the results! We recommend running more iterations and/or  
## setting stronger priors.

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: assetsconsumption\_asinh | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + assetsconsumption\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lroomsnumb + Ldurablesexpenditure + Ldietarydi\_x\_Lassetscon + Lproductiv\_x\_Lassetscon + (1 | block) + (1 | vid)   
## Data: consumption\_assets\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.89 1.09 0.00 2.72 3.49 4 14  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.82 0.55 0.33 1.71 4.43 4 11  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept -0.35 5.35 -15.70 4.06 3.42 4  
## cost\_deviation 0.00 0.00 0.00 0.01 2.12 5  
## treat\_any 0.54 1.22 -1.47 1.88 3.51 4  
## treat\_GK 0.93 1.07 -1.23 1.79 3.56 4  
## assetsconsumption\_asinh\_R1 0.34 0.35 -0.63 0.82 2.46 5  
## Lhh\_wealth\_asinh -0.17 0.23 -0.57 -0.01 1.60 7  
## Lvill\_eligible\_ratio 0.70 0.50 -0.15 1.36 3.28 5  
## Lroomsnumb -0.16 0.81 -1.49 0.95 2.93 5  
## Ldurablesexpenditure -0.00 0.00 -0.00 0.00 1.72 6  
## Ldietarydi\_x\_Lassetscon 0.18 0.29 0.01 0.70 1.74 6  
## Lproductiv\_x\_Lassetscon -0.01 0.07 -0.18 0.08 2.72 5  
## Tail\_ESS  
## Intercept 11  
## cost\_deviation 33  
## treat\_any 11  
## treat\_GK 13  
## assetsconsumption\_asinh\_R1 11  
## Lhh\_wealth\_asinh 15  
## Lvill\_eligible\_ratio 15  
## Lroomsnumb 11  
## Ldurablesexpenditure 11  
## Ldietarydi\_x\_Lassetscon 11  
## Lproductiv\_x\_Lassetscon 11  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 7.29 6.27 3.33 19.92 2.53 6 13  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(consumption\_assets\_normal\_bayesmodel)

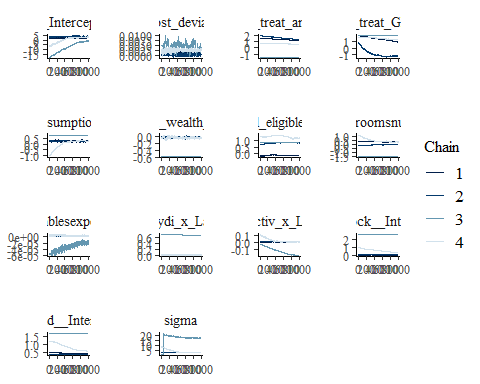
## prior class coef group resp dpar  
## normal(0,6) b   
## normal(0,6) b assetsconsumption\_asinh\_R1   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Ldietarydi\_x\_Lassetscon   
## normal(0,6) b Ldurablesexpenditure   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lproductiv\_x\_Lassetscon   
## normal(0,6) b Lroomsnumb   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 9.8, 2.5) Intercept   
## student\_t(3, 0, 2.5) sd   
## student\_t(3, 0, 2.5) sd block   
## student\_t(3, 0, 2.5) sd Intercept block   
## student\_t(3, 0, 2.5) sd vid   
## student\_t(3, 0, 2.5) sd Intercept vid   
## student\_t(3, 0, 2.5) sigma   
## nlpar bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(consumption\_assets\_normal\_bayesmodel)

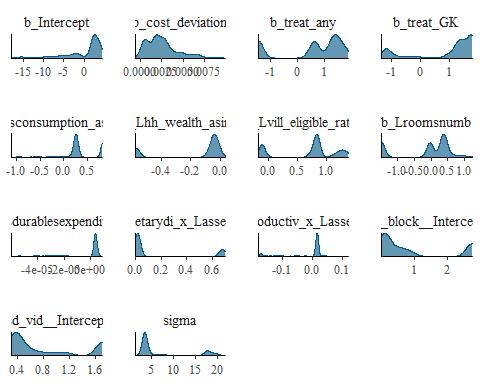
## Parameter Prior\_Quality  
## 1 b\_Intercept informative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any informative  
## 4 b\_treat\_GK informative  
## 5 b\_assetsconsumption\_asinh\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio uninformative  
## 8 b\_Lroomsnumb informative  
## 9 b\_Ldurablesexpenditure uninformative  
## 10 b\_Ldietarydi\_x\_Lassetscon uninformative  
## 11 b\_Lproductiv\_x\_Lassetscon uninformative

Diagnostics

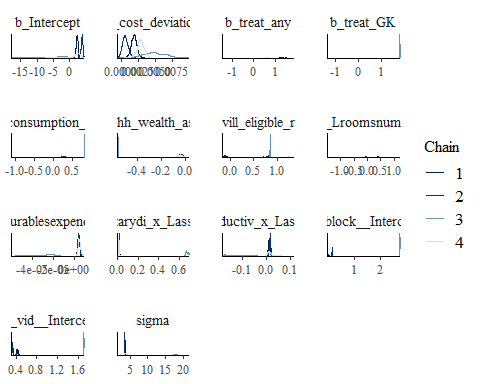
# trace diagnostic plot  
mcmc\_trace(consumption\_assets\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_assetsconsumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "b\_Ldietarydi\_x\_Lassetscon", "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



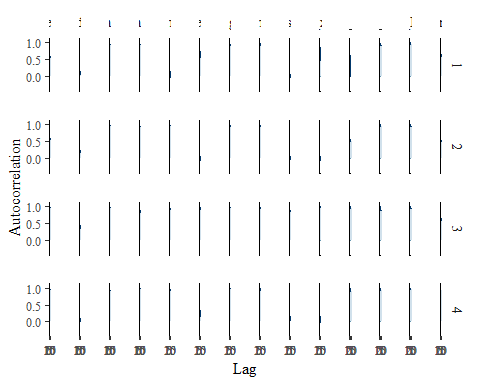
ggsave("table\_3\_diagnostics\\consumption\_assets\_normal\_race.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(consumption\_assets\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_assetsconsumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "b\_Ldietarydi\_x\_Lassetscon", "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\consumption\_assets\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(consumption\_assets\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_assetsconsumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "b\_Ldietarydi\_x\_Lassetscon", "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



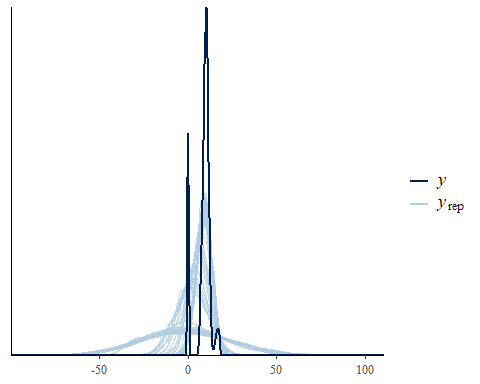
ggsave("table\_3\_diagnostics\\consumption\_assets\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(consumption\_assets\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_assetsconsumption\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "b\_Ldietarydi\_x\_Lassetscon", "b\_Lproductiv\_x\_Lassetscon",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



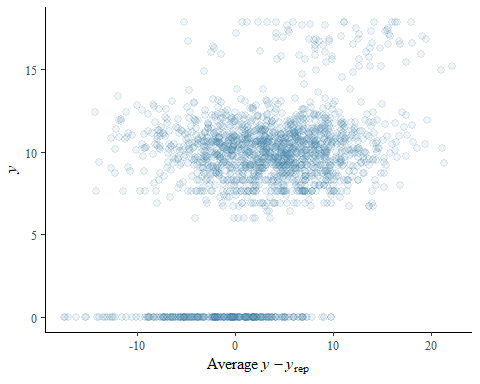
ggsave("table\_3\_diagnostics\\consumption\_assets\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

pp\_check(consumption\_assets\_normal\_bayesmodel, ndraws = 100)



pp\_check(consumption\_assets\_normal\_bayesmodel, ndraws = 10, type = 'error\_scatter\_avg', alpha = .1)



### **House Value** - Secondary Outcome

Load the **house value** model variables

**house value**: This is the basic benchmarking model utilizing a prior normal distribution with mean = 0 and 6 standard deviations. This model had a number of errors and the posterior estimates are unreliable.

* Warning: There were 2023 divergent transitions after warmup. See <https://mc-stan.org/misc/warnings.html#divergent-transitions-after-warmup> to find out why this is a problem and how to eliminate them.
* Warning: There were 1977 transitions after warmup that exceeded the maximum treedepth. Increase max\_treedepth above 10. See <https://mc-stan.org/misc/warnings.html#maximum-treedepth-exceeded>
* Warning: There were 4 chains where the estimated Bayesian Fraction of Missing Information was low. See <https://mc-stan.org/misc/warnings.html#bfmi-low>
* Warning: Examine the pairs() plot to diagnose sampling problems
* Warning: The largest R-hat is 4.46, indicating chains have not mixed. Running the chains for more iterations may help. See <https://mc-stan.org/misc/warnings.html#r-hat>
* Warning: Bulk Effective Samples Size (ESS) is too low, indicating posterior means and medians may be unreliable. Running the chains for more iterations may help. See <https://mc-stan.org/misc/warnings.html#bulk-ess>
* Warning: Tail Effective Samples Size (ESS) is too low, indicating posterior variances and tail quantiles may be unreliable. Running the chains for more iterations may help. See <https://mc-stan.org/misc/warnings.html#tail-ess>

dwelling\_cost\_normal\_bayesmodel <-  
 brm(formula = selfcostdwell\_asinh | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 selfcostdwell\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lroomsnumb + Ldurablesexpenditure +  
 (1 | block) + (1 | vid),  
 data = dwelling\_cost\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\dwelling\_cost\_normal\_bayes")

Model Summery

summary(dwelling\_cost\_normal\_bayesmodel)

## Warning: Parts of the model have not converged (some Rhats are > 1.05). Be  
## careful when analysing the results! We recommend running more iterations and/or  
## setting stronger priors.

## Warning: There were 2023 divergent transitions after warmup. Increasing  
## adapt\_delta above 0.95 may help. See http://mc-stan.org/misc/  
## warnings.html#divergent-transitions-after-warmup

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: selfcostdwell\_asinh | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + selfcostdwell\_asinh\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lroomsnumb + Ldurablesexpenditure + (1 | block) + (1 | vid)   
## Data: dwelling\_cost\_data (Number of observations: 1654)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.83 0.66 0.20 1.93 3.32 4 11  
##   
## ~vid (Number of levels: 247)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.29 0.15 0.16 0.70 4.15 4 11  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept 12.56 8.41 -1.15 26.73 3.35 4  
## cost\_deviation 0.00 0.00 -0.00 0.00 2.59 5  
## treat\_any 0.13 1.02 -1.45 1.51 2.44 5  
## treat\_GK 1.51 0.27 0.94 1.79 3.17 4  
## selfcostdwell\_asinh\_R1 -0.20 0.86 -1.33 0.80 2.56 5  
## Lhh\_wealth\_asinh 0.07 0.06 -0.01 0.19 2.51 5  
## Lvill\_eligible\_ratio 0.69 0.53 -0.19 1.28 3.42 4  
## Lroomsnumb 0.06 0.98 -1.43 1.31 3.07 5  
## Ldurablesexpenditure 0.00 0.00 0.00 0.00 1.85 6  
## Tail\_ESS  
## Intercept 11  
## cost\_deviation 30  
## treat\_any 22  
## treat\_GK 11  
## selfcostdwell\_asinh\_R1 31  
## Lhh\_wealth\_asinh 22  
## Lvill\_eligible\_ratio 11  
## Lroomsnumb 11  
## Ldurablesexpenditure 21  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 3.06 1.95 0.89 8.63 2.91 5 11  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(dwelling\_cost\_normal\_bayesmodel)

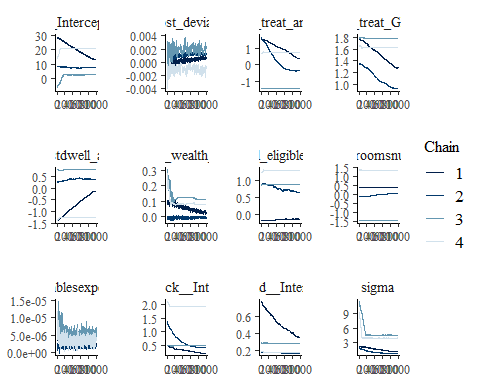
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b Ldurablesexpenditure   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lroomsnumb   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b selfcostdwell\_asinh\_R1   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, 13.8, 2.5) Intercept   
## student\_t(3, 0, 2.5) sd   
## student\_t(3, 0, 2.5) sd block   
## student\_t(3, 0, 2.5) sd Intercept block   
## student\_t(3, 0, 2.5) sd vid   
## student\_t(3, 0, 2.5) sd Intercept vid   
## student\_t(3, 0, 2.5) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(dwelling\_cost\_normal\_bayesmodel)

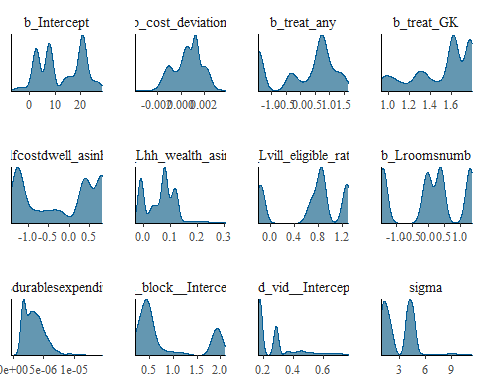
## Parameter Prior\_Quality  
## 1 b\_Intercept informative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any informative  
## 4 b\_treat\_GK uninformative  
## 5 b\_selfcostdwell\_asinh\_R1 informative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio uninformative  
## 8 b\_Lroomsnumb informative  
## 9 b\_Ldurablesexpenditure uninformative

Diagnostics

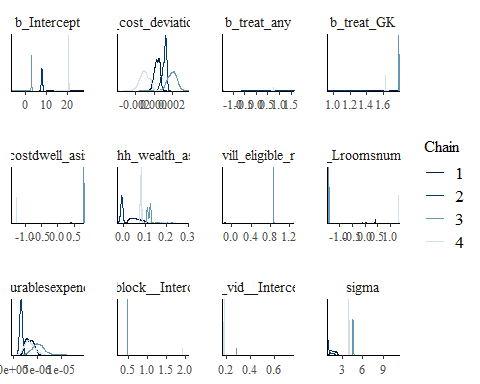
# trace diagnostic plot  
mcmc\_trace(dwelling\_cost\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_selfcostdwell\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



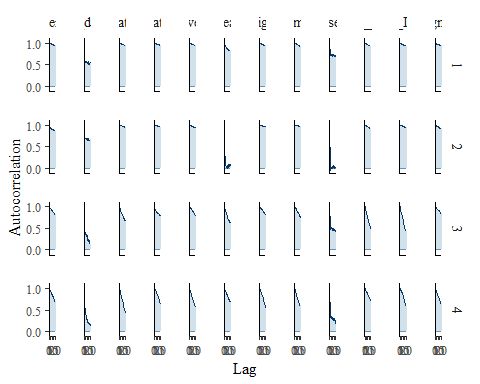
ggsave("table\_3\_diagnostics\\dwelling\_cost\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(dwelling\_cost\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_selfcostdwell\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\dwelling\_cost\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(dwelling\_cost\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_selfcostdwell\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



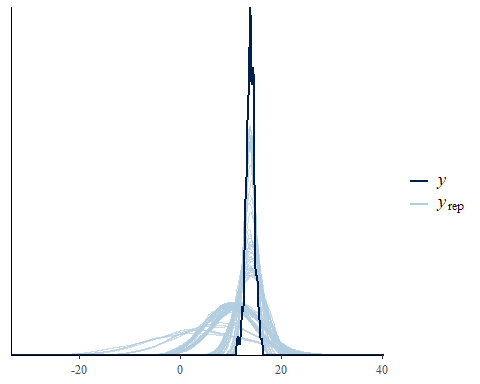
ggsave("table\_3\_diagnostics\\dwelling\_cost\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(dwelling\_cost\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_selfcostdwell\_asinh\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio",   
 "b\_Lroomsnumb", "b\_Ldurablesexpenditure",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



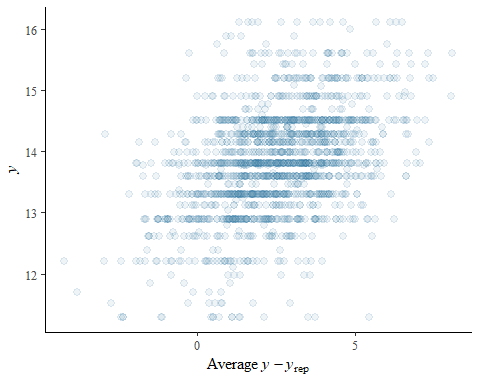
ggsave("table\_3\_diagnostics\\dwelling\_cost\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

pp\_check(dwelling\_cost\_normal\_bayesmodel, ndraws = 100)



pp\_check(dwelling\_cost\_normal\_bayesmodel, ndraws = 10, type = 'error\_scatter\_avg', alpha = .1)



### **house quality** - Secondary Outcome

Load the **house quality** model variables

**house quality**: This is the basic benchmarking model utilizing the default, uninformed priors

housing\_quality\_normal\_bayesmodel <-  
 brm(formula = housing\_quality | weights(samp\_wgt) ~  
 cost\_deviation + treat\_any + treat\_GK +  
 housing\_quality\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lroomsnumb +  
 (1 | block) + (1 | vid),  
 data = housing\_quality\_data,  
 family = gaussian("identity"),  
 set\_prior("normal(0,6)", class = "b"),  
 seed = 1272022,  
 warmup = 1000,  
 iter = 2000,  
 thin = 1,  
 control = list(adapt\_delta = .95, max\_treedepth = 10),  
 #backend = "cmdstanr",  
 cores = 4, #overrides default 1 core  
 #threads = 3,need to get cmdstanr package working here  
 save\_pars = save\_pars(all = TRUE), # potentially allows for more post-processing functionality  
 file = "informed\_prior\_outcomes\\housing\_quality\_normal\_bayes")

Model Summery

summary(housing\_quality\_normal\_bayesmodel)

## Family: gaussian   
## Links: mu = identity; sigma = identity   
## Formula: housing\_quality | weights(samp\_wgt) ~ cost\_deviation + treat\_any + treat\_GK + housing\_quality\_R1 + Lhh\_wealth\_asinh + Lvill\_eligible\_ratio + Lroomsnumb + (1 | block) + (1 | vid)   
## Data: housing\_quality\_data (Number of observations: 1751)   
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;  
## total post-warmup draws = 4000  
##   
## Group-Level Effects:   
## ~block (Number of levels: 22)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.11 0.07 0.01 0.27 1.01 635 1399  
##   
## ~vid (Number of levels: 248)   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sd(Intercept) 0.59 0.05 0.50 0.68 1.00 2097 2836  
##   
## Population-Level Effects:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS  
## Intercept -2.62 0.21 -3.02 -2.21 1.00 4181  
## cost\_deviation 0.00 0.00 -0.00 0.00 1.00 2716  
## treat\_any -0.12 0.13 -0.38 0.14 1.00 2334  
## treat\_GK -0.08 0.13 -0.34 0.18 1.00 2093  
## housing\_quality\_R1 0.01 0.02 -0.03 0.05 1.00 5163  
## Lhh\_wealth\_asinh 0.04 0.01 0.02 0.05 1.00 5704  
## Lvill\_eligible\_ratio 0.14 0.43 -0.69 0.99 1.00 1752  
## Lroomsnumb 0.52 0.04 0.45 0.59 1.00 4986  
## Tail\_ESS  
## Intercept 3366  
## cost\_deviation 2751  
## treat\_any 2695  
## treat\_GK 2609  
## housing\_quality\_R1 3668  
## Lhh\_wealth\_asinh 2826  
## Lvill\_eligible\_ratio 2517  
## Lroomsnumb 2988  
##   
## Family Specific Parameters:   
## Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  
## sigma 1.92 0.02 1.88 1.96 1.00 6705 3269  
##   
## Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  
## and Tail\_ESS are effective sample size measures, and Rhat is the potential  
## scale reduction factor on split chains (at convergence, Rhat = 1).

Prior summery - how informative are priors

prior\_summary(housing\_quality\_normal\_bayesmodel)

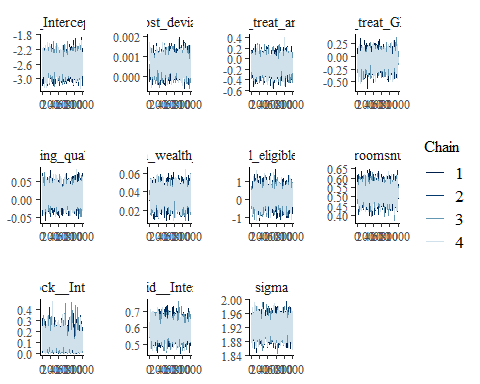
## prior class coef group resp dpar nlpar  
## normal(0,6) b   
## normal(0,6) b cost\_deviation   
## normal(0,6) b housing\_quality\_R1   
## normal(0,6) b Lhh\_wealth\_asinh   
## normal(0,6) b Lroomsnumb   
## normal(0,6) b Lvill\_eligible\_ratio   
## normal(0,6) b treat\_any   
## normal(0,6) b treat\_GK   
## student\_t(3, -0.1, 2.5) Intercept   
## student\_t(3, 0, 2.5) sd   
## student\_t(3, 0, 2.5) sd block   
## student\_t(3, 0, 2.5) sd Intercept block   
## student\_t(3, 0, 2.5) sd vid   
## student\_t(3, 0, 2.5) sd Intercept vid   
## student\_t(3, 0, 2.5) sigma   
## bound source  
## user  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default  
## default  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## (vectorized)  
## default

check\_prior(housing\_quality\_normal\_bayesmodel)

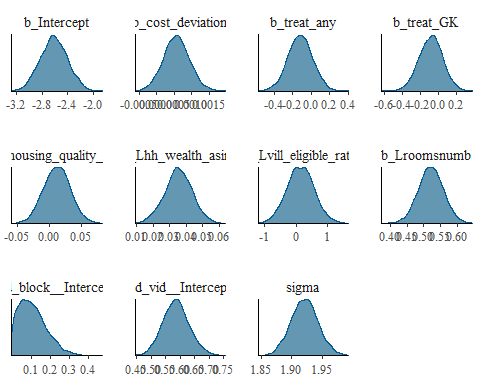
## Parameter Prior\_Quality  
## 1 b\_Intercept informative  
## 2 b\_cost\_deviation uninformative  
## 3 b\_treat\_any uninformative  
## 4 b\_treat\_GK uninformative  
## 5 b\_housing\_quality\_R1 uninformative  
## 6 b\_Lhh\_wealth\_asinh uninformative  
## 7 b\_Lvill\_eligible\_ratio uninformative  
## 8 b\_Lroomsnumb uninformative

Diagnostics

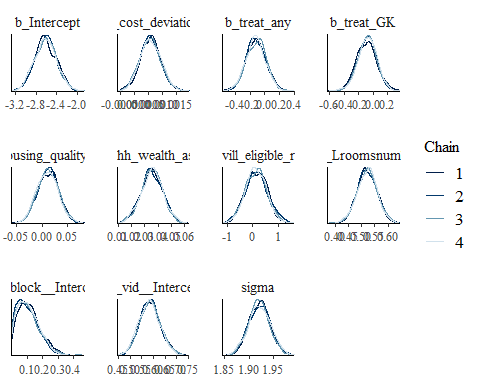
# trace diagnostic plot  
mcmc\_trace(housing\_quality\_normal\_bayesmodel, n\_warmup = 0,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_housing\_quality\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio", "b\_Lroomsnumb",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



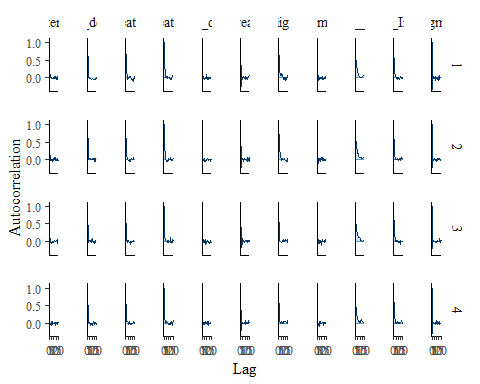
ggsave("table\_3\_diagnostics\\housing\_quality\_normal\_trace.png", plot = last\_plot(), width = 12, height = 5)  
  
#density diagnostic plots  
mcmc\_dens(housing\_quality\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_housing\_quality\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio", "b\_Lroomsnumb",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\housing\_quality\_normal\_dens.png", plot = last\_plot(), width = 12, height = 5)  
  
mcmc\_dens\_overlay(housing\_quality\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_housing\_quality\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio", "b\_Lroomsnumb",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



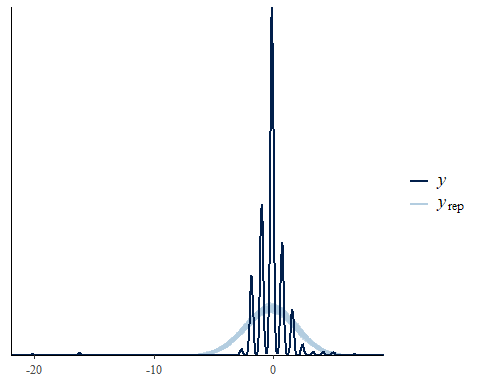
ggsave("table\_3\_diagnostics\\housing\_quality\_normal\_dens\_overlay.png", plot = last\_plot(), width = 12, height = 5)  
  
#acf (auto-correlation) diagnostic plot  
mcmc\_acf(housing\_quality\_normal\_bayesmodel,  
 pars = c("b\_Intercept", "b\_cost\_deviation", "b\_treat\_any", "b\_treat\_GK",  
 "b\_housing\_quality\_R1", "b\_Lhh\_wealth\_asinh", "b\_Lvill\_eligible\_ratio", "b\_Lroomsnumb",  
 "sd\_block\_\_Intercept", "sd\_vid\_\_Intercept", "sigma"))



ggsave("table\_3\_diagnostics\\housing\_quality\_normal\_acf.png", plot = last\_plot(), width = 12, height = 5)

posterior predictive checks

pp\_check(housing\_quality\_normal\_bayesmodel, ndraws = 100)



pp\_check(housing\_quality\_normal\_bayesmodel, ndraws = 10, type = 'error\_scatter\_avg', alpha = .1)

