Supplementary Material for:

Risk factors for respiratory illness in a community of wild chimpanzees (*Pan troglodytes schweinfurthii*)

Melissa Emery Thompson1,2, Zarin P. Machanda2,3, Erik J. Scully4, Drew K. Enigk1, Emily Otali2, Martin N. Muller1,2, Tony L. Goldberg5, Colin A. Chapman6, Richard W. Wrangham2,4.

1 University of New Mexico, Department of Anthropology

2 Kibale Chimpanzee Project

3 Tufts University, Department of Anthropology

4 Harvard University, Department of Human Evolutionary Biology

5 University of Wisconsin-Madison, Department of Pathobiological Sciences and Global Health Institute

6 McGill University, Department of Anthropology

Table S1. Bivariate Spearman’s correlations between variables.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **Ordinal Montha (N = 264)** | **Chimpanzee**  **Respiratory Signsb  (N = 248)** | **Rainfall (N = 264)** | **Maximum Temperature (N = 264)** | **Minimum Temperature**  **(N = 264)** | **Dietary Quality**  **(N = 264)** | **Party Sizec**  **(N = 264)** | **Crop Feeding**  **(N = 264)** | **# of Observers**  **(N = 102)** | **Human Respiratory Symptoms**  **(N = 102)** |
| **Ordinal**  **Month** | |  | 0.11† | -0.02 | 0.17\*\* | 0.47\*\*\* | -0.17\*\* | 0.40\*\*\* | -0.44\*\*\* | 0.01 | -0.33\*\* |
| **Chimpanzee Respiratory Signs** | |  |  | -0.11† | 0.13\* | 0.08 | -0.01 | 0.00 | -0.19\*\* | 0.04 | -0.01 |
| **Rainfall** | |  |  |  | -0.32\*\*\* | 0.19\*\* | -0.04 | -0.01 | -0.08 | -0.31\*\* | 0.11 |
| **Maximum Temperature** | |  |  |  |  | -0.06 | 0.07 | 0.14\* | -0.12 | -0.02 | -0.11 |
| **Minimum Temperature** | |  |  |  |  |  | 0.08 | 0.22\*\*\* | -0.08 | 0.18† | -0.01 |
| **Dietary Quality** | |  |  |  |  |  |  | 0.18\*\* | -0.20\*\* | -0.16† | 0.06 |
| **Party Size** | |  |  |  |  |  |  |  | -0.21\*\*\* | 0.03 | -0.04 |
| **Crop Feeding** | |  |  |  |  |  |  |  |  | 0.18 | -0.06 |
| **# of Observers** | |  |  |  |  |  |  |  |  |  | -0.28 |
|  | \*\*\*p < 0.001; \*\*p < 0.01, \*p< 0.05, †p<0.10; aMonths of study numbered in order 1-264; bPercentage of chimpanzees exhibiting respiratory signs, limited to months with at least 10 individuals represented; cParty size was an individual measure in the models, but here is a global measure across all observations. | | | | | | | | | | |

Table S2. Results of multimodel inference procedure on temporal predictors of respiratory signs. All candidate GLMMs (N = 130) included controls for age, sex, age \* sex, diarrhea, observation hours, and respiratory status in the previous month, as well as a random effect for subject. Shown below are model diagnostics, parameter estimates, model averaged coefficients ( and adjusted standard error, S.E.), and variable importance (Imp) for all models within the 95% confidence set, as determined via the cumulative Akaike weights (Acc *wI*). Also shown are the results of the top model with the variable *Calendar Month* added.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model**  **Rank** | **Intercept** | **Sensitivity** | | | | | | **Exposure** | | | **Calendar Month** | **df** | **ΔAICc** | ***wI*** | **Acc *wI*** | **Evidence**  **Ratio** |
| **Rain** | **Max Temp** | **Min Temp** | **Rain \* Max Temp** | **Rain \* Min Temp** | **Diet Quality** | **Crop Feeding** | **Party Size** | **Crop Feeding \* Party Size** |  |  |  |  |  |  |
| 1 | -3.482\*\*\* | -0.091 | 0.212\*\*\* | 0.072† |  | -0.113\*\* | 0.231\*\*\* | -0.406\*\*\* | -0.530\*\*\* | 0.115† |  | 16 | 0 | 0.403 | 0.403 |  |
| 2 | -3.467\*\*\* | -0.083 | 0.218\*\*\* | 0.074† |  | -0.111\*\* | 0.239\*\*\* | -0.330\*\*\* | -0.570\*\*\* |  |  | 15 | 1.79 | 0.164 | 0.567 | 2.5 |
| 3 | -3.485\*\*\* | -0.084 | 0.211\*\*\* | 0.072† | -0.009 | -0.113\*\* | 0.232\*\*\* | -0.405\*\*\* | -0.530\*\*\* | 0.115† |  | 17 | 1.97 | 0.151 | 0.718 | 2.7 |
| 4 | -3.471\*\*\* | -0.075 | 0.216\*\*\* | 0.074† | -0.009 | -0.110\*\* | 0.239\*\*\* | -0.329\*\*\* | -0.571\*\*\* |  |  | 16 | 3.75 | 0.062 | 0.780 | 6.5 |
| 5 | -3.484\*\*\* |  | 0.237\*\*\* | 0.069 |  |  | 0.218\*\*\* | -0.410\*\*\* | -0.541\*\*\* | 0.104† |  | 14 | 4.27 | 0.048 | 0.828 | 8.4 |
| 6 | -3.491\*\*\* |  | 0.230\*\*\* |  |  |  | 0.210\*\*\* | -0.410\*\*\* | -0.532\*\*\* | 0.107† |  | 13 | 4.71 | 0.038 | 0.866 | 10.6 |
| 7 | -3.471\*\*\* |  | 0.240\*\*\* | 0.072† |  |  | 0.225\*\*\* | -0.341\*\*\* | -0.577\*\*\* |  |  | 13 | 5.38 | 0.027 | 0.893 | 14.9 |
| 8 | -3.489\*\*\* | -0.042 | 0.224\*\*\* | 0.078† |  |  | 0.216\*\*\* | -0.412\*\*\* | -0.540\*\*\* | 0.108† |  | 15 | 5.45 | 0.026 | 0.919 | 15.5 |
| 9 | -3.478\*\*\* |  | 0.233\*\*\* |  |  |  | 0.217\*\*\* | -0.339\*\*\* | -0.570\*\*\* |  |  | 12 | 6.05 | 0.020 | 0.939 | 20.2 |
|  | **-3.480\*\*\*** | **-0.070** | **0.217\*\*\*** | **0.068** | **-0.002** | **-0.093** | **0.231\*\*\*** | **-0.385\*\*\*** | **-0.543\*\*\*** | **0.081** |  |  |  |  |  |  |
| ***Adj S.E.*** |  | **0.058** | **0.046** | **0.047** | **0.020** | **0.057** | **0.056** | **0.074** | **0.058** | **0.072** |  |  |  |  |  |  |
| Imp |  | 0.86 | 1.00 | 0.94 | 0.23 | 0.83 | 1.00 | 1.00 | 1.00 | 0.71 |  |  |  |  |  |  |
| *Top model, adding fixed effect for calendar month* | | | | | | | | | | | | | | | | |
| 1’ | -3.356\*\*\* | 0.001 | 0.150\*\* | 0.095\* |  | -0.070 | 0.304\*\*\* | -0.471\*\*\* | -0.539\*\*\* | 0.081 | 1.860\*\*\* | 27 | -121.50 |  |  |  |
| Significance values determined via Wald test: \*\*\*p<0.001, \*\*p<0.01, \*p<0.05, †p<0.10, | | | | | | | | | | | | | | | | |