***Supplementary material for Statistical Joint Modeling on Longitudinal Body Weight and CD4 Cell Progression with Survival Time-to-Death Predictors on HIV/AIDS Patients in Mekelle General Hospital, Ethiopia***

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| **Table 1:Patient’s characteristics of HIV/AIDS data from Mekelle General Hospital**  |
| **№** | Covariates | Categories | Total No of patient’s (%) | Observed death (%) |  |
| 1 | Sex | Female | 134 (62%) | 10(4.6%) |  |
|  |  | Male | 82(38%) | 21(9.7%) |  |
| 2 | Education level | Illiterate | 57(26.4%) | 16(7.4%) |  |
|  |  | Elementary | 45(20.8%) | 8(3.7%) |  |
|  |  | Secondary | 74(34.3%) | 6(2.8%)  |  |
|  |  | Tertiary | 40(18.5%) | 1(0.46%) |  |
| 3 | Marital status | Single | 54(25%) | 7(3.2%) |  |
|  |  | Married | 109(50.5%) | 11(5%) |  |
|  |  | Divorced | 39(18%) | 5(2.3%) |  |
|  |  | Widowed | 14(6.5%) | 8(3.7%) |  |
| 4 | Functional status | Working | 146(67.6%) | 10(4.6%) |  |
|  |  | Ambulatory | 55(25.5%) | 13(6%) |  |
|  |  | Bedridden | 15(6.9%) | 8(3.7%) |  |
| 5 | WHO clinical stage  | Stage-I | 93(43%) | 8 (3.7%) |  |
|  |  | Stage-II | 63(29.2%) | 5(2.3%) |  |
|  |  | Stage-III | 45(20.8%) | 12 (5.6%) |  |
|  |  | Stage-IV | 15(6.9%) | 6(2.8%) |  |
| 6 | HIV/TB infection | No | 193(89.4%) | 21(10.9%) |  |
|  |  | Yes | 23(10.7%) | 10(43.6%) |  |
| 7 | Adherence on treatment  | good | 96 (44.5%)  | 5(2.3%) |  |
|  |  | Fair  | 74 (34.2%) | 10(4.6%) |  |
|  |  | Poor | 46 (21.29%) | 13(6%) |  |
| 8 | Occupational status | unemployed | 163(75.5%) | 23(10.7%) |  |
|  |  | Employed | 53(24.5%) | 8(3.7%) |  |
| 9 | Place of residence | urban  | 130(60.2%) | 11(5%) |  |
|  |  | Rural | 86(39.8%) | 20(9.3%) |  |
| 10 | Type of ART regiment  | TDF+3TC+EFV  | 135(62.5%) | 12(5.6%) |  |
|  |  | D4t+3TC+NVP  | 20(9.25%) | 13(6%) |  |
|  |  | AZT+3TC+NVP | 40(18.5%) | 13(6%) |  |
|  |  | AZT+3TC+EFV  | 21(9.7%) | 3(1.4%) |  |
|  | Continuous variables | mean | standard deviation |  |  |
| 11 | CD4 at base line | 311 | 163.6 |  |  |
| 12 | Body weight at base line | 49.2 | 9.85 |  |  |
| 13 | Hemoglobin at base line | 13.6 | 1.98 |  |  |
| 14 | Age at base line | 34.8 | 11 |   |  |

**Table2: shows the Comparison of separate and joint model analysis √(CD4 cell) with Survival Time-to-Death.**

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| No. | Parameter | Separate model analysis of survival analysis | Joint model sub model |
|  | Fixed effect | B̑ | Se(B̑) | z-value | Pr(>|z|)

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 | B̑ | Se(B̑) | z-value | p-value |
| 1 | Function status |  |  |  |  |  |  |  |  |
| Bedridden(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Ambulatory | -0.732 | 0.595 | -1.231 | 0.218 | -0.5247 | 1.0577 | -0.496 | 0.125 |
| Working | -0.4316 | 0.7092 | -0.609 | 0.5428 | -0.42 | 1.0332 | -0.4065 | 0.178 |
| 2 | Baseline CD4 | -0.00513 | 0.001433 | -3.578 | 0.00037\* | -0.0045 | 0.0015 | -3.053 | 0.0023\* |
| 3 | Adherence |  |  |  |  |  |  |  |  |
| Poor(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Fair | -1.493 | 0.513 | -2.914 | 0.00357\* | -1.5526 | 0.5323 | -2.92 | 0.0035\* |
| Good | -1.837 | 0.64098 | -2.866 | 0.004163\* | -1.735 | 0.6405 | -2.709 | 0.0068\* |
| 4 | Baseline weight | 0.0402 | 0.0229 | 1.755 | 0.04791\* | 0.0433 | 0.0227 | 1.9755 | 0.04793\* |
| 5 | Sex |  |  |  |  |  |  |  |  |
| female(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Male | 1.443 | 0.494 | 2.921 | 0.00349\* | 1.227 | 0.486 | 2.522 | 0.0117\* |
| 6 | HIV/TB status |  |  |  |  |  |  |  |  |
| No(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Yes | 1.899 | 0.745 | 2.55 | 0.023\* | 2.101 | 0.676 | 3.1 | 0.0210\* |
| **Separate model analysis of longitudinal** | **Joint model sub model** |
| Paraeters | B̑ | Se(B̑) | z-value | Pr(>|z|)

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 | B̑ | Se(B̑) | z-value |  |
|  | Intercept  | 16.01 | 2.0398 | 7.86 | 0.0000\* | 16.053 | 1.98 | 8.1 | <0.0001\* |
| 1 | Time | -0.826 | 0.274 | -3.01 | 0.0027\* | -0.827 | 0.2702 | -3.06 | 0.0022\* |
| 2 | Baseline CD4 | 0.0213 | 0.0018 | 12.2 | 0.0000\* | 0.0234 | 0.00051 | 10.5 | 0.0000\* |
| 3 | Baseline weight | 0.061 | 0.0267 | 2.268 | 0.0244\* | 0.0605 | 0.0258 | 2.346 | 0.019\* |
| 4 | Function status |  |  |  |  |  |  |  |  |
| Bedridden(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Ambulatory | -3.84 | 1.71 | -2.246 | 0.0258\* | -3.85 | 1.665 | -2.31 | 0.0207\* |
| Working | -2.649 | 1.72 | -1.536 | 0.1261 | -2.665 | 1.679 | -1.587 | 0.1124 |
| 5 | HIV/TB status |  |  |  |  |  |  |  |  |
| HIV/TB(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| HIV/TB(yes) | -3.2 | 1.276 | -2.51 | 0.0130\* | -2.169 | 1.245 | -1.735 | 0.109 |
| 6 | Education-level |  |  |  |  |  |  |  |  |
| Illiterate(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| primary | 0.2232 | 0.698 | 0.32033 | 0.7491 | 0.2195 | 0.6709 | 0.3272 | 0.7435 |
| secondary | 0.5004 | 0.626 | 0.7999 | 0.4247 | 0.495 | 0.6027 | 0.8214 | 0.4114 |
| Tertiary | 0.50056 | 0.737 | 0.6795 | 0.4976 | 0.4954 | 0.7097 | 0.6981 | 0.4851 |
| 7 | Age | -0.0279 | 0.0228 | -1.22 | 0.223 | -0.0278 | 0.0224 | -1.243 | 0.2138 |
| 8 | Adherence |  |  |  |  |  |  |  |  |
| Poor(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Fair | 1.723 | 1.015 | 1.698 | 0.0911 | 1.73 | 0.9898 | 1.7485 | 0.0804 |
| Good | 0.73 | 1.066 | 0.685 | 0.494 | 0.7445 | 1.04 | 0.7158 | 0.4741 |
| 9 | WHO stage |  |  |  |  |  |  |  |  |
| Stage-4(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Stage-3 | 1.11 | 1.24 | 0.895 | 0.372 | 1.097 | 1.2 | 0.9137 | 0.3609 |
| Stage-2 | 1.19 | 1.25 | 0.955 | 0.341 | 1.19 | 1.2065 | 0.9892 | 0.3226 |
| Stage-1 | 2.199 | 1.288 | 1.71 | 0.089 | 2.189 | 1.2454 | 1.758 | 0.0789 |
| 10 | Marital status |  |  |  |  |  |  |  |  |
| Single(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| married | -1.181 | 0.5642 | -2.094 | 0.0375\* | -1.178 | 0.5442 | 2.164 | 0.00304\* |
| Divorced | -1.3357 | 0.731 | -1.827 | 0.059 | -1.338 | 0.7086 | -1.988 | 0.049\* |
| Widowed | -0.647 | 1.037 | -0.624 | 0.533 | -0.6537 | 0.998 | -0.655 | 0.5125 |
| 11 | Time\*Baseline CD4 | 0.0028 | 0.00037 | 7.512 | 0.0000\* | 0.00194 | 0.000191 | 5.322 | <0.0001\* |
| 12 | Time\*HIV/TB |  |  |  |  |  |  |  |  |
| Time\*No(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Time\*Yes | 0.531 | 0.236 | 2.25 | 0.025\* | 0.5209 | 0.233 | 2.239 | 0.025\* |
| 13 | Time\*function-status |  |  |  |  |  |  |  |  |
| Time\*Bedridden(R) | ------- | ------- | ------- | ------- | ------- | ------- | ------- | ------- |
| Time\*Ambulatory | 0.923 | 0.297 | 3.102 | 0.002\* | 0.926 | 0.2925 | 3.165 | 0.0015\* |
| Time\*working | 0.905 | 0.296 | 3.06 | 0.0023\* | 0.91 | 0.291 | 3.126 | 0.0018\* |
|  | Random effect | variance | Std.Dev |  |  | variance |  |  |  |
|  | (Intercept) | 19.98 | 4.47 |  |  | 18.49 | 4.3 |  |  |
|  | Time | 0.5476 | 0.74 |  |  | 0.5184 | 0.72 |  |  |
|  | Residual | 6.0025 | 2.45 |  |  | 5.9731 | 2.444 |  |  |
|  | Association | -------- | -------- | -------- | -------- | -0.6693 | 0.336 | -1.992 | 0.0367\* |
|  | AIC | 6823.45 |  |  |  | 6602.83 |  |  |  |
|   | \*P -value< 0.05 | R = reference group |   |   |   |   |   |   |