Discussion with Vincent about data quality:

Checks (Vincent’s answer):

1. Comparison of Nbouts and Nblocks variables : Each of the Nbouts variable was equal to its corresponding Nblock variable.
2. Check if total number of block (Nblocks\_day\_total…) for each activity is equal to sum of “unbouted” and “bouted” blocks: This was true for IN and LIG. There was **difference for MVPA,** (nblocks\_day\_mod\_unbt\_wei + nblocks\_day\_vig\_unbt\_wei + nblocks\_day\_mvpa\_bts\_10\_wei **≠** nblocks\_day\_total\_mod\_wei + nblocks\_day\_total\_vig\_wei) **although it was small** (average difference: 0.983 bouts).

THIS IS BECAUSE A SINGLE MVPA BOUT CAN REPRESENT MULTIPLE MOD AND/OR VIG BLOCKS. When an MOD is followed by an VIG bout they are both counted, but when part of MVPA they merge into a single larger bout.

1. Comparison of Nblocks\_day\_total... and FRAG\_Nfragments... variables:  As we do not consider any grace period, the total number of blocks must be equal to total number of fragments. We found **small differences between total number of blocks and total number of fragments for IN** (average difference: 0.0232 blocks), **LIG** (average difference: 0.164 blocks) and **MVPA** (computed as nblocks\_day\_total\_mod\_wei + nblocks\_day\_total\_vig\_wei; average difference: 0.62 blocks). For example, the comparison variables for IN were nblocks\_day\_total\_in\_wei vs frag\_nfragments\_1\_day\_wei.

NFRAG VARIABLES ARE ONLY CALCULATED WHEN THERE ARE AT LEAST 10 FRAGMENTS IN A DAY. ONLY A FEW OF THE FRAG VARIABLES ARE CALCULATED REGARDLESS OF THE NUMBER OF FRAGMENTS. THIS MEANS THAT THESE DAYS ARE IGNORED FOR THE PERSONLEVEL SUMMARY FOR FRAG, BUT NOT IN THE PERSON LEVEL SUMMARY FOR NBLOCKS.

If I understood well:

- if the nb of bouts during the day is **>=** 10 (in day-level summary): the day is included in fragmentation variables computation (in person-level summary).

- if the nb of bouts during the day is **<** 10 (in day-level summary): the day is excluded from fragmentation variables computation (in person-level summary).

🡪 Further, please note that this decision is made for the binary fragmentation variables and separately for the multiclass fragmentation variables

TO CHECK THAT THE CALCULATION IS CORRECT YOU COULD INSTEAD COMPARE DAYLEVEL ESTIMATES AND EXCLUDE DAYS WHERE FRAG VARIABLES ARE MISSING.

THE PERSON LEVEL SUMMARY IS DERIVED IN THE SAME WAY FOR ALL VARIABLES AND THE CODE FOR THAT IS SHORT. SO, IF THERE IS A BUG IN THE CODE YOU SHOULD BE TO SPOT THIS IN DAYSUMMARY.

*I performed the check you suggested: in the day-level summary I excluded the days with less than 10 bouts and computed the average number of bouts per person. Then, I compared these estimates to the plain NFRAG variables in the person-level summary (FRAG\_Nfragments\_1\_day\_pla, FRAG\_Nfragments\_LIPA\_day\_pla, FRAG\_Nfragments\_MVPA\_day\_pla) (see attached the related code).*

*I obtained similar estimates of nb of fragments at person level for IN and LIPA, with some exceptions (see in the script the stno where I found greater differences). I found different estimates of nb of MVPA fragments at person level (average diff: 2.37 fragments). Based on that, I computed daily number of MVPA fragments using all days (not excluding those with less than 10 bouts of MVPA) and found substantially lower difference (average diff : 0.00018 fragments).*

***Question: are days with less than 10 bouts of MVPA included in the computation of nb of fragments at person-level?***

The number of MVPA fragments plays no role. Note that if there are no MVPA fragments then Nfragments\_IN2MVPA = 0 and IN2MVPA\_TP = 0, which is still informative and those days are part of the person summary. The only criteria for day exclusion is the number of fragments in the data, regardless of whether those fragments are LIPA or MVPA.

1. We would expect the sum of MVPA fragments + LIPA fragment to be equal to total PA fragments, which was not the case (**average** **difference of 37.9 fragments, which seems huge).** Computed as: frag\_nfragments\_mvpa\_day\_wei + frag\_nfragments\_lipa\_day\_wei **≠** frag\_nfragments\_0\_day\_wei.

THIS IS BECAUSE A SINGLE PA FRAGMENT CAN REPRESENT MULTIPLE LIPA AND/OR MVPA FRAGMENTS. When an MVPA is followed by an LIPA bout they are both counted, but when part of PA they merge into a single larger bout.

1. Check if total duration is equal to the sum of unbouted and bouted durations given no grace period: True for all activity levels.
2. Mean duration of fragments: example for MVPA: (dur\_day\_total\_mod\_min\_wei + dur\_day\_total\_vig\_min\_wei) /frag\_nfragments\_mvpa\_day\_wei **≠** FRAG\_mean\_dur\_MVPA\_day\_wei. **There are differences, albeit small** (average difference: 0.524 minutes for IN, 0.0219 minutes  for LIPA, 0.111 minutes for MVPA).

SEE POINT ABOVE REGARDING THAT FRAG VARIABLES ARE NOT CALCULATED FOR EVERY DAY

Issue on Github: <https://github.com/vincentvanhees/anr-accelerometry/issues/25>

Fragmentation variables and when they are calculated:

| **Old variable name** | **Proposed new variable name** | **Calculated when** |
| --- | --- | --- |
| FRAG\_Nfragments\_IN2LIPA\_day | FRAG\_Nfrag\_IN2LIPA\_day | Always |
| FRAG\_Nfragments\_IN2MVPA\_day | FRAG\_Nfrag\_IN2MVPA\_day | Always |
| FRAG\_Nfragments\_MVPA\_day | FRAG\_Nfrag\_MVPA\_day | Always |
| FRAG\_Nfragments\_LIPA\_day | FRAG\_Nfrag\_LIPA\_day | Always |
| FRAG\_Nfragments\_0\_day | FRAG\_Nfrag\_PA\_day | Always |
| FRAG\_Nfragments\_1\_day | FRAG\_Nfrag\_IN\_day | Always |
| FRAG\_PA2IN\_TP\_day | FRAG\_TP\_PA2IN\_day | Always |
| FRAG\_IN2PA\_TP\_day | FRAG\_TP\_IN2PA\_day | Always |
| FRAG\_IN2LIPA\_TP\_day | FRAG\_TP\_IN2LIPA\_day | Always |
| FRAG\_IN2MVPA\_TP\_day | FRAG\_TP\_IN2MVPA\_day | Always |
| FRAG\_TP01\_acc\_day | to be left out as too hard to interpret | - |
| FRAG\_TP10\_acc\_day | to be left out as too hard to interpret | - |
| FRAG\_TP01\_vol\_day | to be left out as too hard to interpret | - |
| FRAG\_TP10\_vol\_day | to be left out as too hard to interpret | - |
| FRAG\_mean\_dur\_MVPA\_day | FRAG\_mean\_dur\_MVPA\_day | Always |
| FRAG\_mean\_dur\_LIPA\_day | FRAG\_mean\_dur\_LIPA\_day | Always |
| FRAG\_mean\_dur\_0\_day | FRAG\_mean\_dur\_PA\_day | Always |
| FRAG\_mean\_dur\_1\_day | FRAG\_mean\_dur\_IN\_day | Always |
| FRAG\_Gini\_dur\_0\_day | FRAG\_Gini\_dur\_PA\_day | >= 10 PA fragments |
| FRAG\_Gini\_dur\_1\_day | FRAG\_Gini\_dur\_IN\_day | >= 10 IN fragments |
| FRAG\_CoV\_dur\_0\_day | FRAG\_CoV\_dur\_PA\_day | >= 10 PA fragments |
| FRAG\_CoV\_dur\_1\_day | FRAG\_CoV\_dur\_IN\_day | >= 10 IN fragments |
| FRAG\_alpha\_dur\_0\_day | FRAG\_alpha\_dur\_PA\_day | >= 10 PA fragments |
| FRAG\_alpha\_dur\_1\_day | FRAG\_alpha\_dur\_IN\_day | >= 10 IN fragments |
| FRAG\_x0.5\_dur\_0\_day | FRAG\_x0.5\_dur\_PA\_day | >= 10 PA fragments |
| FRAG\_x0.5\_dur\_1\_day | FRAG\_x0.5\_dur\_IN\_day | >= 10 IN fragments |
| FRAG\_W0.5\_dur\_0\_day | FRAG\_W0.5\_dur\_PA\_day | >= 10 PA fragments |
| FRAG\_W0.5\_dur\_1\_day | FRAG\_W0.5\_dur\_IN\_day | >= 10 IN fragments |

Mathilde: if the criterion is not meet, is the variable flagged as NA ? or 0 ?

Vincent: If the criteria is not met, we want Nfragments to be zero, but Gini index or alpha to be missing and not zero, right?

Séverine: I think so, I see the meaning of a 0 for mean duration and N\_frag, but I am not sure there is meaning in Gini index of alpha when there are no sereral bouts. As we remove these metrics (complex metrics) for MVPA and LIPA, II don't think it will remove a lot of observations

Séverine’s suggestion: Set

FRAG\_mean\_dur\_MVPA\_day=0 When 0 MVPA fragment  
FRAG\_mean\_dur\_LIPA\_day =0 When 0 LIPA fragment  
FRAG\_mean\_dur\_0\_day=0 When 0 PA fragment  
FRAG\_mean\_dur\_1\_day=0 When 0 IN fragment

Vincent: Excluded days will show up in the report as an empty cell. Inside R I assign NA for those days, which I replace by "" before the report is stored in csv format.

* New variables to indicate the number of days used to compute fragmentation variables

Nvaliddays = total number of valid days  
Nvaliddays\_WD = valid week days  
Nvaliddays\_WE = valid weeknd days  
Nvaliddays\_atleast10frags = total valid days with at least 10 fragments  
Nvaliddays\_atleast10frags\_WD = valid weekdays with at least 10 fragments  
Nvaliddays\_atleast10frags\_WE = valid weekdays with at least 10 fragments