



Visit 15 – Actigraphy Dataset

CODEBOOK

ARCHIVED DATASET 2026

Dataset file niaacte152026

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DOCUMENTATION FOR THE SWAN VISIT 15 ACTIGRAPHY DATASET

This dataset contains all publicly available SWAN Visit 15 actigraphy data. This includes the actigraphy enrollment form, the weekly physical activity data, and the sleep summary data.

A. Who is included in the public use dataset:

The dataset contains information for the 2029 women with Visit 15 actigraphy data from the seven participating SWAN clinical sites. The sites include 11, 12, 13, 14, 15, 16 and 17.

The assigned participant ID has been replaced with a randomly generated ARCHID in order to protect participant privacy. The baseline interview date is denoted as day 0 and is used as the basis for all other dates. Variables describing the race/ethnicity of participants (RACE) was added from the Screener dataset.

B. Missing data coding:

Original missing codes (-1: not applicable, -7: refused, -8: don't know, -9: missing) have been recoded to SAS missing codes (.B: not applicable, .D: refused, .C: don't know, and .A: missing).

C. Weekly Physical Activity Actigraphy Data

The weekly physical activity data was gathered from the ActiGraph wGT3X-BT Accelerometer waist monitor worn by a subset of SWAN women at Visit 15 for 10 hours for at least four days. The weekly dataset has a single observation from each ID summarizing her activity over the period that she wore the monitor (NOTE: this is NOT standardized to a week for each woman. The data may be from more or less than 7 days – see the variable TOT10D_S17 for the number of days a woman wore the waist monitor).

Sample selection:

Women were asked during in-person SWAN visits if they would be willing to wear the waist-worn physical activity monitor in addition to a wrist-worn sleep monitor. Each site was asked to recruit an equal amount of white and ethnic minority women, prioritizing women who participated in the original SWAN Ancillary sleep study.

Accelerometer protocol:

Accelerometer data was collected over an 8-day period for each woman participating in the protocol. Women were instructed to wear an ActiGraph wGT3X-BT Accelerometer waist monitor during hours she was awake, removing it to shower and swim. She also filled out a diary each day to record when she put the monitor on and removed it. After 8 days of wear, she was instructed to mail the monitor and the Physical Activity Diary back to the SWAN study site in a pre-addressed, pre-stamped envelope.

When the monitors were returned to the sites, participant data was downloaded using ActiLife6 software. The downloaded files are then sent to the Coordinating Center for file reintegration and data reduction and processing.

Data processing:

Using the Actilife6 software, files were reintegrated from raw data, collected at 40 Hz each second, to 60 second intervals (epochs). The reintegrated files were then processed through an R package called "PhysicalActivity" that includes an algorithm called the Choi Algorithm to detect and remove periods of non-wear of the accelerometer.¹ The days that a woman reported starting and stopping wearing then monitor from the Physical Activity Diary were also used to estimate wear time, per recommendations from Keadle et al.²

Once the non-wear periods were removed, daily summary estimates of sedentary time and physical activity were calculated and weekly summary estimates of sedentary time and physical activity are calculated for participants with at least 4 valid days of 10 or more hours of wear time.

Raw data from accelerometers were read in one minute "epochs," each of which has a three-dimensional numerical value of the intensity of movement (i.e., accelerometer count) a woman was doing during that minute. To estimate the time spent sedentary and in light-, moderate-, and vigorous- intensity physical activity, established accelerometer count cut point threshold values are applied.

For SWAN, three commonly used count cut-point threshold strategies were selected for use with the vertical axis count data only: NHANES³, Freedson⁴, and Matthews⁵ cut points. All variables using specific cut-point thresholds contain a single letter near the end of the variable name identifying the method used – "N" for NHANES, "F" for Freedson, and "M" for Matthews.

In addition to data output from the vertical axis, the vector magnitude (VM) estimates are also included. Vector magnitude is the square root of the sum of squares of each axis of data. To operationalize the triaxial count data into time spent sedentary and in light-, moderate-, and vigorous intensity physical activity, Evenson cutpoints⁶ were used. All variable using triaxial data contain “VM” near the end of the variable names.

Alongside the accumulated number of minutes spent per day in moderate to vigorous intensity physical activity, the frequency and duration of “bouts” of MVPA accumulated for at least 8 out of 10 consecutive minutes were calculated.⁷

The standard naming formula for the variables with specific cut points and/or bout calculations are as follows:

Prefix	Meaning
BF	Bout Frequency
BD	Bout Duration

Core	Meaning
SED	Sedentary
LITE	Light Intensity
LLITE	Low-Light Intensity
HLITE	High-Light Intensity
MOD	Moderate Intensity
MLI	Moderate Lifestyle Intensity
MWI	Moderate Walk Intensity
MVPA	Moderate to Vigorous Intensity
VIG	Vigorous Intensity
MET	Estimated Energy Expenditure

Suffix 1	Meaning
M	Matthews
F	Freedson
N	NHANES
VM	Vector Magnitude
S	Schwartz

Suffix 2	Meaning
M	Mean
S	Sum

For example, variables in the weekly dataset include:

- **MWIM_M15**: Mean Daily Moderate Walk Intensity Time - Matthews (min/day ct=1952-5724)
- **MODF_S15**: Total Min Moderate Intensity (Freedson) Over All Min of All Full Days
- **VIGN_M15**: Mean Daily Vigorous Intensity Time - NHANES (min/day ct>=5999)
- **BDMVPAVM_M15**: Mean Daily MVPA Bout Duration - VM (min/day ct>=2075, 8/10 min)

Note that variables are all appended with “15” to indicate the visit number, with the exception of the variables ID and VISIT.

Created flag variables: After the data were processed by the R code, several flags were added.

- **GE10DFLG15**: Flag for if a participant wore the monitor for more than 10 days (protocol stated only 8 were expected).
- **WAKE18A15**: Flag for if a participant wore the monitor for more than 18 hours on average (NOTE: this is different than the same variable name in the daily data set).

Correcting for sleep & sedentary time overlap:

As part of the data cleaning process for the physical activity actigraphy, some corrections needed to be made such that there was no overlapping data with the sleep actigraphy datasets. There are two main parts to this process: 1) identifying waking activity and sleep activity pairings that constitute a single day, and 2) correcting the activity measures so that a person’s sleep isn’t measured as sedentary activity.

When identifying these pairings, the Choi algorithm is first run using the raw data, after which waking/sleeping pairs are determined by choosing pairs under 1440 minutes (24 hours) that have a minimum amount of time in between start/stop instances. If this condition is not met, then the activity period does not get paired with a sleep period. Ideally, an activity period will be paired with a sleep period both before and after the recorded activity, but there are some instances where an activity period was only paired with either a preceding or proceeding sleep period, and others where the activity period was not able to be paired with any sleep period. Once these sleep-to-wake transitions were determined, the initial range of activity periods were updated so that there was no overlap with sleep, and the Choi algorithm was re-run with these new boundaries. Below is a summary of how the daily activity records were corrected by the sleep data:

If/How Activity Data is Corrected by Sleep Data	N
The daily activity period was successfully paired with sleep periods both before and after. There is no overlap between sleep and sedentary activity time.	7,224
The daily activity period only has sleep paired before the activity occurred, but not after. There is still potential overlap between sedentary activity and sleep around the time the individual was falling asleep.	478
The daily activity period only has sleep paired after the activity occurred, but not before. There is still potential overlap between sleep and sedentary activity around the time the individual was waking up.	1,464
The daily activity period was not paired with any sleep periods. There is still potential overlap between sleep and sedentary activity at the times when the individual was waking up and falling asleep.	795

Sources:

- 1) <https://cran.r-project.org/web/packages/PhysicalActivity/index.html>
- 2) Keadle SK, Shiroma EJ, Freedson PS, Lee IM. Impact of accelerometer data processing decisions on the sample size, wear time and physical activity level of a large cohort study. *BMC Public Health*. 2014 Nov 24;14:1210. doi:10.1186/1471-2458-14-1210.
- 3) Troiano RP, Berrigan D, Dodd KW, Mâsse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008 Jan;40(1):181-8. PubMed PMID: 18091006.
- 4) Freedson PS, Melanson E, Sirard J. Calibration of the Computer Science and Applications, Inc. accelerometer. *Med Sci Sports Exerc*. 1998 May;30(5):777-81. PubMed PMID: 9588623.
- 5) Matthews CE. Calibration of accelerometer output for adults. *Med Sci Sports Exerc*. 2005 Nov;37(11 Suppl):S512-22. Review. PubMed PMID: 16294114.
- 6) Evenson KR, Wen F, Herring AH, Di C, LaMonte MJ, Tinker LF, Lee IM, Rillamas-Sun E, LaCroix AZ, Buchner DM. Calibrating physical activity intensity for hip-worn accelerometry in women age 60 to 91 years: The Women's Health Initiative OPACH Calibration Study. *Prev Med Rep*. 2015;2:750-756. PubMed PMID: 26527313; PubMed Central PMCID: PMC4625400.
- 7) Troiano RP, Berrigan D, Dodd KW, Mâsse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008 Jan;40(1):181-8. PubMed PMID: 18091006.

D. Sleep Summary Actigraphy Data**Description of Actigraphy sleep data collection & processing**

Participants wore the actigraphy device (AW-2 Philips Respironics) continuously on their non-dominant wrist, for a mean of “x” days. Participants were instructed to press the event-marker when they went to bed to sleep and when they got out of bed to start the day. The AW-2 accelerometer was set at 0.05 g for 3 to 11 Hz. The analog signal was digitized by the digital integration method. The wake threshold was set at 40 counts per minute. Data were sampled in one-minute epochs and analyzed with the sleep detection algorithm by Actiware 5.0.9 software (Philips Respironics).

Actigraphy records were given an initial quality check on receipt to the Center for Sleep and Circadian Sciences (CSCS) at the University of Pittsburgh. The initial review determined if the recording encountered any issues, such as watch failure, initialization and/or download error. Furthermore, a minimum of 3 nights of continuous actigraphy recording was required for further analysis. Notations on each record were taken and included information on the number of naps indicated in the diary, if the Actiwatch was removed on any given night, and if the participant's overall rest/active pattern was consistent or varied. Notes were also taken if any given nap was indicated in the diary but corresponding actigraphy data did not score any sleep during that time-period. It was also noted if the event-markers were used as instructed or if the rest intervals were set using the diary times. A data field indicating the source of the rest interval is included in the final dataset.

All records were scored with the diary “in-hand”. The diary was reviewed for nap times and information on any watch removal times. Rest intervals were set using the event-marker as a first choice where possible. Many of the participants used the event-marker as instructed. If no event-markers were present or were used in a sporadic manner the diary times of “I tried to go to sleep” and “I got out of bed” were used to set the rest interval. There were participants that did not complete and/or return a diary to their site. In these cases, automated scoring was used and indicated in the record.

In cases where the participant indicated a nap that preceded or proceeded her primary rest interval by less than 30 minutes the nap time was incorporated into the primary rest interval. There were a few occasions where daytime naps were indicated in the actigraphy record by event-markers but not indicated in the diary. These naps were scored using the event-markers.

An emphasis was placed on ensuring a record of actigraphy for each corresponding diary record. In cases where the participant removed the watch during a primary rest period a rest interval was set and the data were subsequently exported. These individual nights of actigraphy rest/sleep were then given a “Bad” use code in the dataset and a comment, “Watch removed”. This was done to minimize confusion for investigators using both the actigraphy and diary datasets. Investigators will expect 7 nights of actigraphy and corresponding diary data; if the number of expected records do not match, the explanation is available.

Each SWAN site actigraphy database was automatically uploaded to the SWAN Website and received by the CSCS on a weekly basis. Records were scored in batches of 17 to 30 records per site, per week, and exported in a .csv file format.

The exported data file was also cleaned of any non-data records prior to import into SQL. Non-data records were usually found at the beginning and end of an actigraphy record. These would include periods of time where the participant had not yet put the device on her wrist and periods of time from the end of the study until download of the data record on site.

A front-end Access database, with SQL Server back-end, was developed by the actigraphy experts at the CSCS. The imported data file was then run through a series of SQL views. At this stage of data cleaning, two monitor screens are used, one where the actigraphy records are viewed and one where the corresponding data record is viewed. One SQL view was developed to tease out the nap records, once identified in the data and then confirmed by view of the actogram, the interval identification was changed to “nap”. This allows all rest and sleep periods to be easily separated for analyses. SQL views were also run to confirm any outlier data values in the variables of Bedtime, Waketime, Sleep Onset Latency, Total Sleep Time, Total Wake Time, Interval duration, Fragmentation Index and Percent Invalid data.

The final cleaned data files were then exported into excel format and sent to the SWAN Coordinating Center via the SWAN Website. The SWAN Coordinating Center also received, for each actigraphy record, the epoch-by-epoch data file, a copy of the cleaned data Actogram, corresponding light data file, and the most recent Actiware database for each site. A tracking file for each record provides the SWAN CC with additional information on overall data quality and comments.

The SWAN CC data and analysis teams ran their data queries, on each rest/sleep interval, to test for inconsistencies, outliers, and missing records. The SWAN CC would then send their inquiries back to the CSCS for review. Each record was reviewed using the actogram and any needed value, scoring, or comment changes were made. The files were then sent back to the SWAN CC for further review. This process continued until no results appeared in their queries.

Variables included in the dataset:

Variable	Label	Codes
ARCHID	Participant ID	
VISIT	Study Visit	"15" = Visit 15
RACE	Race/Ethnicity	1 = Black 2 = Chinese/Chinese American 3 = Japanese/Japanese American 4 = White Non-Hispanic 5 = Hispanic
Actigraphy Enrollment Form Variables		
DCOMPDAY15	Day of Actigraphy Enrollment Form Completion	Days since baseline interview
AGE15	Age (Continuous)	[Numeric]
WATCHGIV15	Participant agreed to wear both devices?	1 = No 2 = Yes
DGACTDAY15	Day Actiwatch Given	Days since baseline interview
DGWGTDAY15	Day Actigraph WGT3X Given	Days since baseline interview
ACTIWRET15	Was Actiwatch Returned?	1 = No 2 = Yes
DRACTDAY15	Day Actiwatch Returned	Days since baseline interview
WGT3XRET15	Was Actigraph WGT3X Returned?	1 = No 2 = Yes
DRWGTDAY15	Day Actigraph WGT3X Returned	Days since baseline interview
DIARYRET15	Was Sleep Diary Returned?	1 = No 2 = Yes
Physical Activity Variables		
TOT10D_S15	Total Days Monitor Worn >=10 hrs	[Numeric]
NWPER_M15	Mean # Non-wear Periods (per day)	[Numeric]
OBSMIN_M15	Mean Daily Wear Time (min/day)	[Numeric]
TOTCTD_M15	Mean Total Accel Counts Over All Min of All Full Days	[Numeric]
MEANCTD_M15	Mean Daily Avg Accel Counts Over All Min of All Full Days	[Numeric]
TOTVM_M15	Mean Total VM Counts Over All Min of All Full Days	[Numeric]
MEANVM_M15	Mean Daily Avg VM Counts Over All Min of All Full Days	[Numeric]
METF_M15	Mean Daily METs - Freedson Equation	[Numeric]
METS_M15	Mean Daily METs - Schwartz Equation	[Numeric]
BREAK_M15	Mean Daily Inactive-to-Active Transitions	[Numeric]
BREAKPH_M15	Mean Daily Inactive-to-Active Transitions (per inactive hr)	[Numeric]
INACT_M15	Mean Daily Sedentary Min (ct<100)	[Numeric]
ACTIVE_M15	Mean Daily Active Min (ct>=100)	[Numeric]
LITEM_M15	Mean Daily Light Intensity Time - Matthews (min/day ct=100-759)	[Numeric]
MLIM_M15	Mean Daily Moderate Lifestyle Intensity Time - Matthews (min/day ct=760-1951)	[Numeric]
MWIM_M15	Mean Daily Moderate Walk Intensity Time - Matthews (min/day ct=1952-5724)	[Numeric]
MODM_M15	Mean Daily Moderate Intensity Time - Matthews (min/day ct=760-5724)	[Numeric]
MODM_S15	Total Min of Mod Intensity (Matthews) Over All Min of All Full Days	[Numeric]
VIGM_M15	Mean Daily Vigorous Intensity Time - Matthews (min/day ct>=5725)	[Numeric]
VIGM_S15	Total Min of Vigorous Intensity (Matthews) Over All Min of All Full Days	[Numeric]

Variable	Label	Codes
MVPA1M_M15	Mean Daily MVPA1 Time - Matthews (min/day ct>=760)	[Numeric]
MVPA1M_S15	Total Min MVPA1 (Matthews) Over All Min of All Full Days	[Numeric]
MVPA2M_M15	Mean Daily MVPA2 Time - Matthews (min/day ct>=1952)	[Numeric]
MVPA2M_S15	Total Min MVPA2 (Matthews) Over All Min of All Full Days	[Numeric]
LITEF_M15	Mean Daily Light Intensity Time - Freedson (min/day ct=100-1951)	[Numeric]
MODF_M15	Mean Daily Moderate Intensity Time - Freedson (min/day ct=1952-5724)	[Numeric]
MODF_S15	Total Min Moderate Intensity (Freedson) Over All Min of All Full Days	[Numeric]
VIGF_M15	Mean Daily Vigorous Intensity Time - Freedson (min/day ct>=5725)	[Numeric]
VIGF_S15	Total Min Vigorous Intensity (Freedson) Over All Min of All Full Days	[Numeric]
MVPAF_M15	Mean Daily MVPA Time - Freedson (min/day ct>=1952)	[Numeric]
MVPAF_S15	Total Min MVPA (Freedson) Over All Min of All Full Days	[Numeric]
LITEN_M15	Mean Daily Light Intensity Time - NHANES (min/day ct=100-2019)	[Numeric]
MODN_M15	Mean Daily Moderate Intensity Time - NHANES (min/day ct=2020-5998)	[Numeric]
MODN_S15	Total Min Moderate Intensity (NHANES) Over All Min of All Full Days	[Numeric]
VIGN_M15	Mean Daily Vigorous Intensity Time - NHANES (min/day ct>=5999)	[Numeric]
VIGN_S15	Total Min Vigorous Intensity (NHANES) Over All Min of All Full Days	[Numeric]
MVPAN_M15	Mean Daily MVPA Time - NHANES (min/day ct>=2020)	[Numeric]
MVPAN_S15	Total Min MVPA (NHANES) Over All Min of All Full Days	[Numeric]
SEDVM_M15	Mean Daily Sedentary Time - Evenson/VM (min/day ct=0-75)	[Numeric]
LLITEVM_M15	Mean Daily Low-Light Intensity Time - VM (min/day ct=76-903)	[Numeric]
HLITEVM_M15	Mean Daily High-Light Intensity Time - VM (min/day ct=904-2075)	[Numeric]
MVPAVM_M15	Mean Daily MVPA Time - VM (min/day ct>=2075)	[Numeric]
MVPAVM_S15	Total Min MVPA (VM) Over All Min of All Full Days	[Numeric]
BFMVPA1M_M15	Mean Daily MVPA1 Bout Frequency - Matthews (min/day ct>=760, 8/10 min)	[Numeric]
BDMVPA1M_M15	Mean Daily MVPA1 Bout Duration - Matthews (min/day ct>=760, 8/10 min)	[Numeric]
BFMVPA2M_M15	Mean Daily MVPA2 Bout Frequency - Matthews (min/day ct>=1952, 8/10 min)	[Numeric]
BDMVPA2M_M15	Mean Daily MVPA2 Bout Duration - Matthews (min/day ct>=1952, 8/10 min)	[Numeric]
BFVIGM_M15	Mean Daily Vigorous Int Bout Frequency - Matthews (min/day ct>=5725, 8/10 min)	[Numeric]
BDVIGM_M15	Mean Daily Vigorous Int Bout Duration - Matthews (min/day ct>=5725, 8/10 min)	[Numeric]
BFMVPAF_M15	Mean Daily MVPA Bout Frequency - Freedson (min/day ct>=1952, 8/10 min)	[Numeric]
BDMVPAF_M15	Mean Daily MVPA Bout Duration - Freedson (min/day ct>=1952, 8/10 min)	[Numeric]
BFVIGF_M15	Mean Daily Vigorous Int Bout Frequency - Freedson (min/day ct>=5725, 8/10 min)	[Numeric]

Variable	Label	Codes
BDVIGF_M15	Mean Daily Vigorous Int Bout Duration - Freedson (min/day ct>=5725, 8/10 min)	[Numeric]
BFMVPAN_M15	Mean Daily MVPA Bout Frequency - NHANES (min/day ct>=2020, 8/10 min)	[Numeric]
BDMVPAN_M15	Mean Daily MVPA Bout Duration - NHANES (min/day ct>=2020, 8/10 min)	[Numeric]
BFVIGN_M15	Mean Daily Vigorous Int Bout Frequency - NHANES (min/day ct>=5999, 8/10 min)	[Numeric]
BDVIGN_M15	Mean Daily Vigorous Int Bout Duration - NHANES (min/day ct>=5999, 8/10 min)	[Numeric]
BFMVPAVM_M15	Mean Daily MVPA Bout Frequency - VM (min/day ct>=2075, 8/10 min)	[Numeric]
BDMVPAVM_M15	Mean Daily MVPA Bout Duration - VM (min/day ct>=2075, 8/10 min)	[Numeric]
GE10DFLG15	Flag: Monitor Worn >=10 Days	0 = Not Flagged 1 = Flagged
WAKE18A15	Flag: Monitor Worn >18 hrs/day on Average	0 = Not Flagged 1 = Flagged
Sleep Variables		
TRP_MEAN15	Mean of Total Time in Bed	[Numeric]
MFI_MEAN15	Mean of Movement and Fragmentation Index	[Numeric]
TST_MEAN15	Mean of Total Sleep Time	[Numeric]
SE_MEAN15	Mean of Sleep Efficiency	[Numeric]
WASO_MEAN15	Mean of Wake after Sleep Onset	[Numeric]
SOL_MEAN15	Mean of Sleep Onset Latency	[Numeric]
SM_MEAN15	Mean of Sleep Maintenance	[Numeric]
TRP_SD15	Standard Deviation of Total Time in Bed	[Numeric]
MFI_SD15	Standard Deviation of Movement and Fragmentation Index	[Numeric]
TST_SD15	Standard Deviation of Total Sleep Time	[Numeric]
SE_SD15	Standard Deviation of Sleep Efficiency	[Numeric]
WASO_SD15	Standard Deviation of Wake after Sleep Onset	[Numeric]
SOL_SD15	Standard Deviation of Sleep Onset Latency	[Numeric]
SM_SD15	Standard Deviation of Sleep Maintenance	[Numeric]
SLEEPIDPT_MEAN15	Average Sleep Midpoint	[Numeric]
SLEEPIDPT_SD15	SD of Sleep Midpoint	[Numeric]
COUNT15	Total # of Valid Nights Used for Calculating Average Values	[Numeric]
NUM_WEEKDAY15	# of Valid Weekdays Nights Used for Calculating Average Values	[Numeric]
NUM_WEEKENDS15	# of Valid Weekends Nights Used for Calculating Average Values	[Numeric]
SLEEP_START_MEAN15	Mean of Sleep Start Time	[Numeric]
SLEEP_END_MEAN15	Mean of Sleep End Time	[Numeric]
REST_START_MEAN15	Mean of Rest Start Time	[Numeric]
REST_END_MEAN15	Mean of Rest End Time	[Numeric]
SLEEP_START_SD15	SD of Sleep Start Time	[Numeric]
SLEEP_END_SD15	SD of Sleep End Time	[Numeric]
REST_START_SD15	SD of Rest Start Time	[Numeric]
REST_END_SD15	SD of Rest End Time	[Numeric]
TRP_NAP_MEAN15	Mean of Total Nap Time in Bed	[Numeric]

Variable	Label	Codes
TST_NAP_MEAN15	Mean of Scored Total Sleep Time for Naps	[Numeric]
TRP_NAP_SD15	Standard Deviation of Total Nap Time in Bed	[Numeric]
TST_NAP_SD15	Standard Deviation of Scored Total Sleep Time for Naps	[Numeric]
NUM_NAPS_M15	Mean Total # of Naps Taken	[Numeric]
NUM_NAPS_SD15	Standard Deviation of Total # of Naps Taken	[Numeric]

EXPLANATION OF WEEKLY ACTIVITY VARIABLES AND SUMMARIES

Standard variables:

- TOT10D_S15 = Total number of days when the monitor was worn for ≥ 10 hours.
- OBSMIN_M15 = Average wear time across all days when the monitor was worn ≥ 10 hours.
- TOTCTD_M15 = Average total activity counts across all days when the monitor was worn ≥ 10 hours.
- TOTVM_M15 = Average total Vector Magnitude counts across all days when the monitor was worn ≥ 10 hours.
- MEANCTD_M15 = Average of the mean daily activity counts per minute across all days when the monitor was worn ≥ 10 hours.
- MEANVM_M15 = Average of the mean daily Vector Magnitude counts per minute across all days when the monitor was worn ≥ 10 hours.

Freedson cut points:

Variable	Description
LITEF_M15	Mean daily minutes of light intensity activity where accelerometer count/cut-points = 100-1951.
MODF_M15	Mean daily minutes of moderate intensity activity where accelerometer count/cut-points = 1952-5724.
MODF_S15	Total number of minutes spent in moderate intensity activity over all days with valid wear data where accelerometer count/cut-points = 1952-5724.
VIGF_M15	Mean daily minutes of vigorous intensity activity where accelerometer count/cut-points ≥ 5725 .
VIGF_S15	Total number of minutes spent in vigorous intensity activity over all days with valid wear data where accelerometer count/cut-points ≥ 5725 .
MVPAF_M15	Mean daily minutes of MVPA intensity where accelerometer count/cut-points ≥ 1952 .
MVPAF_S15	Total number of minutes spent in MVPA intensity over all days with valid wear data where accelerometer count/cut-points ≥ 1952 .
BFMVPAF_M15	Mean daily bout frequency of MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 1952 .
BDMVPAF_M15	Mean daily bout duration of MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 1952 .
BFVIGF_M15	Mean daily bout frequency of vigorous intensity activity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 5725 .
BDVIGF_M15	Mean daily bout duration of vigorous intensity activity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 5725 .

Matthews cut points:

Variable	Description
LITEM_M15	Mean daily minutes of light intensity activity where accelerometer count/cut-points = 100-759.
MLIM_M15	Mean daily minutes of moderate lifestyle intensity activity where accelerometer count/cut-points = 760-1951.
MWIM_M15	Mean daily minutes of moderate walk intensity activity where accelerometer count/cut-points = 1952-5724.
MODM_M15	Mean daily moderate intensity activity where accelerometer count/cut-points = 760-5724.
MODM_S15	Total number of minutes spent in moderate intensity activity over all days with valid wear data where accelerometer count/cut-points = 760-5724.
VIGM_M15	Mean daily minutes of vigorous intensity activity where accelerometer count/cut-points ≥ 5725 .
VIGM_S15	Total number of minutes spent in vigorous intensity activity over all days with valid wear data where accelerometer count/cut-points ≥ 5725 .
MVPA1M_M15	Mean daily minutes of lower threshold MVPA activity where accelerometer count/cut-points ≥ 760 .
MVPA1M_S15	Total number of minutes spent in lower threshold MVPA intensity over all days with valid wear data where accelerometer count/cut-points ≥ 760 .

Variable	Description
MVPA2M_M15	Mean daily minutes of higher threshold MVPA activity where accelerometer count/cut-points ≥ 1952 .
MVPA2M_S15	Total number of minutes spent in higher threshold MVPA intensity over all days with valid wear data where accelerometer count/cut-points ≥ 1952 .
BFMVPA1M_M15	Mean daily bout frequency of lower threshold MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 760 .
BDMVPA1M_M15	Mean daily bout frequency of lower threshold MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 760 .
BFMVPA2M_M15	Mean daily bout frequency of higher threshold MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 1952 .
BDMVPA2M_M15	Mean daily bout frequency of higher threshold MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 1952 .
BFVIGM_M15	Mean daily bout frequency of vigorous intensity activity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 5725 .
BDVIGM_M15	Mean daily bout frequency of vigorous intensity activity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 5725 .

NHANES cut points:

Variable	Description
LITEN_M15	Mean daily minutes of light intensity activity where accelerometer count/cut-points = 100-2019.
MODN_M15	Mean daily moderate intensity activity where accelerometer count/cut-points = 2020-5998.
MODN_S15	Total number of minutes spent in moderate intensity activity over all days with valid wear data where accelerometer count/cut-points = 2020-5998.
VIGN_M15	Mean daily minutes of vigorous intensity activity where accelerometer count/cut-points ≥ 5999 .
VIGN_S15	Total number of minutes spent in vigorous intensity activity over all days with valid wear data where accelerometer count/cut-points ≥ 5999 .
MVPAN_M15	Mean daily minutes of MVPA intensity where accelerometer count/cut-points ≥ 2020 .
MVPAN_S15	Total number of minutes spent in MVPA intensity over all days with valid wear data where accelerometer count/cut-points ≥ 2020 .
BFMVPAN_M15	Mean daily bout frequency of MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 2020 .
BDMVPAN_M15	Mean daily bout duration of MVPA intensity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 2020 .
BFVIGN_M15	Mean daily bout frequency of vigorous intensity activity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 5999 .
BDVIGN_M15	Mean daily bout frequency of vigorous intensity activity where at least 8 of 10 minutes in the bout have accelerometer count/cut-points ≥ 5999 .

Evenson vector magnitude cut points:

Variable	Description
SEDVM_M15	Mean daily minutes of sedentary time where vector magnitude count/cut-points = 0-75.
LLITEVM_M15	Mean daily minutes of low-light intensity activity where vector magnitude count/cut-points = 76-903.
HLITEVM_M15	Mean daily minutes of high-light intensity activity where vector magnitude count/cut-points = 904-2075.
MVPAVM_M15	Mean daily minutes of MVPA intensity where vector magnitude count/cut-points ≥ 2075 .
MVPAVM_S15	Total number of minutes spent in MVPA intensity over all days with valid wear data where vector magnitude count/cut-points ≥ 2075 .
BFMVPAVM_M15	Mean daily bout frequency of MVPA intensity where at least 8 of 10 minutes in the bout have vector magnitude count/cut-points ≥ 2075 .

Variable	Description
BDMVPAVM_M15	Mean daily bout duration of MVPA intensity where at least 8 of 10 minutes in the bout have vector magnitude count/cut-points ≥ 2075 .

Additional weekly variables:

Variable	Description
NWPER_M15	Mean number of non-wear periods per day.
METF_M15	Mean daily METs according to the Freedson equation.
METS_M15	Mean daily METs according to the Schwartz equation.
BREAK_M15	Mean daily inactive-to-active transitions.
BREAKPH_M15	Mean daily inactive-to-active transitions per inactive hour.
INACT_M15	Mean daily sedentary minutes where accelerometer count < 100 .
ACTIVE_M15	Mean daily active minutes where accelerometer count ≥ 100 .

EXPLANATION OF SLEEP SUMMARY VARIABLES

- Total # of Valid Nights (**COUNT15**): Number of valid nights used for calculating average values, created by the available sleep records of each participant across the observational period.
- Total # of Naps Taken (**NUM NAPS M15**, **NUM NAPS SD15**) indicates the mean and standard deviation of number of naps taken across the entire observation.
- Mean and Standard Deviation of Total Sleep Time (**TST MEAN15** and **TST SD15**): Total Sleep Time is calculated by the total number of epochs between start time and end time of given interval scored as SLEEP multiplied by the Epoch Length in minutes (default is one minute epochs). The mean and standard deviation were then created.
- Mean and Standard Deviation of Total Time in Bed (**TRP MEAN15** and **TRP SD15**): Total Time in Bed is calculated by the Start Time and End time of each daily primary rest interval. The mean and standard deviation of rest duration were then created and included in the final dataset.
- Mean and Standard Deviation of Total Nap Time (**TST NAP MEAN15** and **TST SD15**): Total Nap Time is calculated by the total number of epochs between Start Time and End Time of each daily primary interval scored as SLEEP multiplied by the Epoch Length in minutes. The mean and standard deviation of sleep total were then created and included in the final dataset. For women who only reported one nap, their standard deviation of total nap time was set to missing.
- Mean and Standard Deviation of Total Nap Time Based (**TRP NAP MEAN15** and **TRP NAP SD15**): Total Nap Time is calculated by the Start Time and End time of the given rest interval. The mean and standard deviation of rest duration were then created and included in the final dataset. For women who only reported one nap, their standard deviation of total nap time was set to missing.
- Mean and Standard Deviation of Movement and Fragmentation Index (**MFI MEAN15** and **MFI SD15**): Movement and Fragmentation Index is a composite measure of sum of two percentages and was calculated based on immobile and mobile values for each primary interval. The mean and standard deviation of the movement and fragmentation index were then created and included in the final dataset.
- Mean and Standard Deviation of Sleep Onset Latency (**SOL MEAN15** and **SOL SD15**): Sleep Onset Latency is the time elapsed between the Start Time of the given Rest Interval and the following Sleep Start Time, in minutes. The mean and standard deviation of sleep onset latency were then created and included in the final dataset.
- Mean and Standard Deviation of Sleep Efficiency (**SE MEAN15** and **SE SD15**): Sleep Efficiency is the percentage of Scored Total Sleep Time to the Rest Interval Duration calculated for each primary interval. The mean and standard deviation of sleep efficiency were then created and included in the final dataset.
- Mean and Standard Deviation of Sleep Maintenance (**SM MEAN15** and **SM SD15**): Sleep Maintenance is the percentage of Total Sleep Time to the time in minutes between Sleep Start and Sleep End for the Sleep Interval calculated for each primary interval. The mean and standard deviation of sleep maintenance were then created and included in the final dataset.
- Mean and Standard Deviation of Wake after Sleep Onset (**WASO MEAN15** and **WASO SD15**): Wake after Sleep Onset is the total number of epochs between the Start Time and the End Time of each daily primary SLEEP Interval scored as WAKE by the software multiplied by the epoch length in minutes. The mean and standard deviation of wake after sleep onset were then created and included in the final dataset.
- Mean and Standard Deviation of Sleep Midpoint (**SLEEPMIDPT MEAN15** and **SLEEPMIDPT SD15**): The means and standard deviations of the sleep midpoint were created and included in the final dataset in numeric format and centered around midnight. For each participant, the mean sleep midpoint was calculated across all nights of valid data. The standard deviation of the sleep midpoint was calculated across all nights of valid data and provides a measure of sleep regularity; higher values indicate more irregularity in sleep timing.
- Total # of Weeknights (**NUM WEEKDAY15**): The # of valid nights used for calculating summarized values that were 'weeknights' (Sun, Mon, Tues, Wed, Thurs).
- Total # of weekend (**NUM WEEKENDS15**): The # of valid nights used for calculating summarized values that were 'weekend' nights (Fri, Sat) .
- Mean and Standard Deviation of Rest Start (**REST START MEAN15** and **REST START SD15**): The start time of each primary rest interval corresponds to the time the participant got into bed and attempted to sleep (i.e., bedtime). The mean and standard deviation of rest start were created from Rest Start Time in numeric format and centered around midnight. For example: a mean bedtime of 23:00 (11:00 PM) is conveyed as -1.00.

- Mean and Standard Deviation of Rest End (**REST_END_MEAN15** and **REST_END_SD15**): The end time of each primary rest interval corresponds to the time the participant got out of bed (i.e., rise time). The mean and standard deviation of rest end were created from Rest End Time in numeric format and centered around midnight. For example: a mean rest end time of 07:00 (7:00 AM) is conveyed as 7.00.
- Mean and Standard Deviation of Sleep Start (**SLEEP_START_MEAN15** and **SLEEP_START_SD15**): The start time of each primary sleep interval corresponds to the time the participant started sleeping (i.e., sleep onset). The mean and standard deviation of sleep start were created from Sleep Start Time in numeric format and centered around midnight. For example: a mean sleep start time of 23:00 (11:00 PM) is conveyed as -1.00.
- Mean and Standard Deviation of Sleep End (**SLEEP_END_MEAN15** and **SLEEP_END_SD15**): The end time of each primary sleep interval corresponds to the time the participant ended their sleep (i.e., sleep offset). The mean and standard deviation of sleep end were created from Sleep End Time in numeric format and centered around midnight. For example: a mean sleep end time of 07:00 (7:00 AM) is conveyed as 7.00.

DATA COLLECTION FORMS

= Variable excluded from public use datafile

~ A randomly generated ID will be provided that is different from the original ID

† This date is given in days since the initial baseline interview, which is day zero

Date Data Entered / Initials _____

Date Verified / Initials _____

ACTIGRAPHY ENROLLMENT FORM

Study of Women's Health Across the Nation

SECTION A. GENERAL INFORMATION

A1. RESPONDENT ID: AFFIX ID LABEL HERE ARCHID~

A2. SWAN STUDY VISIT # 15 VISIT

A3. FORM VERSION: 02/27/2015 #FORM_V

A4. DATE FORM COMPLETED: / / DCOMPDAY15†

M M D D Y Y Y Y

A5. INTERVIEWER'S INITIALS: #INITS

A6. RESPONDENT'S DOB: / / 1 9 #DOB

M M D D Y Y Y Y

VERIFY WITH RESPONDENT

A.7. DID THE PARTICIPANT AGREE TO WEAR BOTH DEVICES? WEARBOTH15

NO1

YES.....2 **B1**

A7.1 REASON WHY THE PARTICIPANT DID NOT AGREE #NOTAGREE15

NOT APPROACHED/DID NOT ATTEND IN PERSON VISIT1 **END**

NOT APPROACHED/ENROLLMENT CLOSED.....2 **END**

NOT APPROACHED/NO ACTIWATCH OR WGT3X AVAILABLE3 **END**

UNABLE TO COMPLY WITH PROTOCOL.....4 **END**

INELIGIBLE5 **END**

OTHER6 **END**

IF OTHER, SPECIFY _____

REFUSED.....-7 **A7.2**

A7.2 REFUSAL TYPE #REFUTYPE15

REFUSED TO WEAR ACTIWATCH1 **END**

REFUSED TO WEAR WGT3X2 **END**

REFUSED TO WEAR BOTH.....3 **END**

SECTION B. DEVICES PROVIDED TO PARTICIPANT

ACTIWATCH (SLEEP)

B1. RECORD ACTIWATCH SERIAL ID: A _____ **#WATCHID15**

B2. ACTIWATCH GIVEN TO PARTICIPANT ON: _____ / _____ / _____ **DGACTDAY15[†]**
M M D D Y Y Y Y

ACTIGRAPH WGT3X (ACTIVITY)

B3. RECORD WGT3X NUMBER
(SITE NUMBER – 1 THRU 20): _____ **#WGT3XNUM15**

B4. WGT3X GIVEN TO PARTICIPANT ON: _____ / _____ / _____ **DGWGTDAY15[†]**
M M D D Y Y Y Y

SECTION C. RETURN OF DEVICES AND DIARY

ACTIWATCH (SLEEP)

C1. WAS THE ACTIWATCH RETURNED? **ACTIWRET15**

NO (ALL EFFORTS TO OBTAIN HAVE BEEN EXHUAsted).....1 **C2**
YES.....2

C1.1. ACTIWATCH RETURNED ON: _____ / _____ / _____ **DRACTDAY15[†]**
M M D D Y Y Y Y

ACTIGRAPH WGT3X (ACTIVITY)

C2. WAS THE WGT3X RETURNED? **WGT3XRET15**

NO (ALL EFFORTS TO OBTAIN HAVE BEEN EXHUAsted).....1 **C3**
YES.....2

C2.1. WGT3X RETURNED ON: _____ / _____ / _____ **DRWGTDAY15[†]**
M M D D Y Y Y Y

DIARY

C3. WAS THE SLEEP AND PHYSICAL ACTIVITY DIARY RETURNED? **DIARYRET15**

NO1
YES.....2