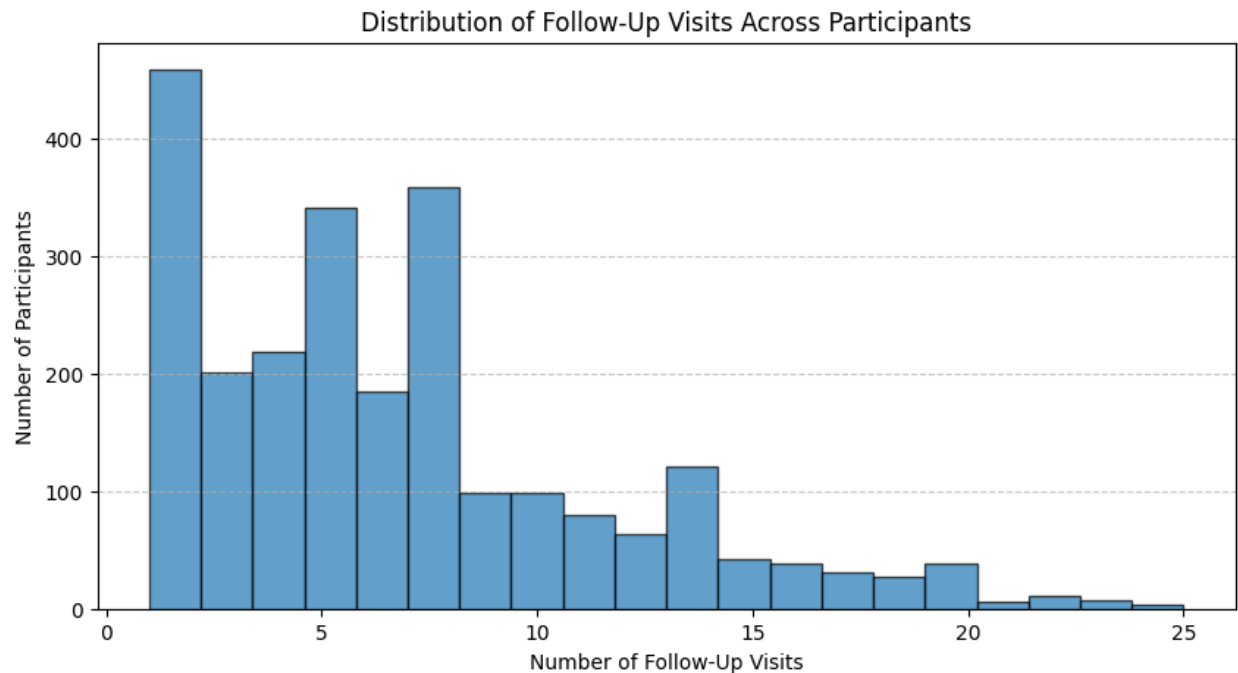


# Baseline Analysis

## Questions:

1. Phases of ADNI and Longitudinal Follow ups:
  - a. Should we consider only ADNI1 or ADNI2 as the baseline? Or can we incorporate baseline data from all the phases as long as they are followup visits for those participants?
  - b. How many participants have longitudinal data with multiple ADNI phases?
2. MRI versions and preprocessing considerations:
  - a. What are the different MRI acquisition protocols and preprocessing pipeline versions?
  - b. Can we ensure that the MRI versions remain consistent or how does other literature use different MRI versions?
3. Diffusion Tensor Imaging Availability:
  - a. How many participants across ADNI phases have DTI scans available? And are those protocols consistent across ADNI phases?
4. Sociodemographic Considerations:
  - a. How well are sociodemographic factors such as ethnicity, income, education level represented in ADNI?
  - b. Can we account for regional disparities in sleep quality?
  - c. Do we have information on conditions such as sleep apnea or hypoxia, and how these affect the sleep disturbances?
5. Visit Lags:
  - a. How frequently are MRI and sleep questionnaire data collected for each participants across follow up visits?
  - b. How many participants have missing data for MRI, sleep or other biomarkers in follow-up visits
6. Alluvial Plot:
  - a. Visualizing the transition of participants across Diagnosis using an alluvial plot

## Analyses:



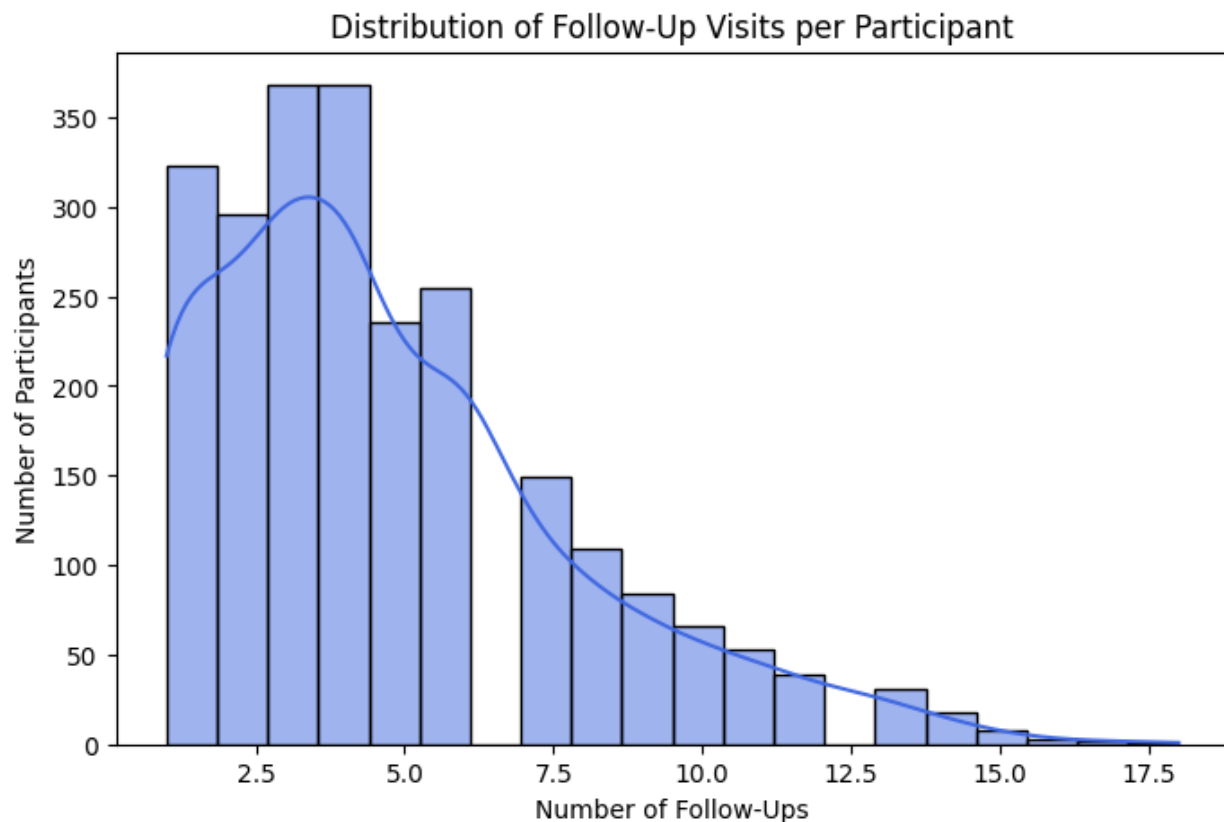
If we incorporate the baseline data from all the phases, we have about 1971 participants with more than 2 total visits (including baseline) from the total 2430 participants (2419 available participants).

The Best approach is to use all available ADNI baselines while ensuring longitudinal follow-ups with more than 2 visits from baseline exists.

Baseline	Converted?	Number of participants	Final
AD	No	405	AD
AD	Yes	6	MCI
CN	No	432	CN
CN	Yes	19	Dementia
CN	Yes	91	MCI
EMCI	No	301	EMCI
EMCI	Yes	56	CN
EMCI	Yes	65	Dementia
EMCI	Yes	1	MCI
LMCI	No	338	LMCI
LMCI	Yes	39	CN
LMCI	Yes	312	Dementia

LCMI	Yes	1	MCI
SMC	No	317	SMC
SMC	Yes	4	Dementia
SMC	Yes	32	MCI

Total Follow-up visits per participant:



This suggests that, Number of follow-ups should be around 3-4 to get the most out of longitudinal study. (6 months, 12 months, 24 months and/or, 48 months).

The ADNI MRI protocol is updated every new grant cycle. The current ADNI 4 consists of nine different series types.

The ADNI1 (2004-2009) focused on structural imaging using 1.5T scanners.

The ADNI2/GO (2009-2016) introduced to use the 3T scanners.

The ADNI3 (2016-2023) conducted entirely at 3T.

The ADNI4 Aims to maintain longitudinal consistency while adopting new technologies.

ADNI used consistency MRI data acquisition method across sites and over time,

including achieving similar image qualities: contrast-to-noise ratio, spatial resolution, and resistance to artifacts across sites.

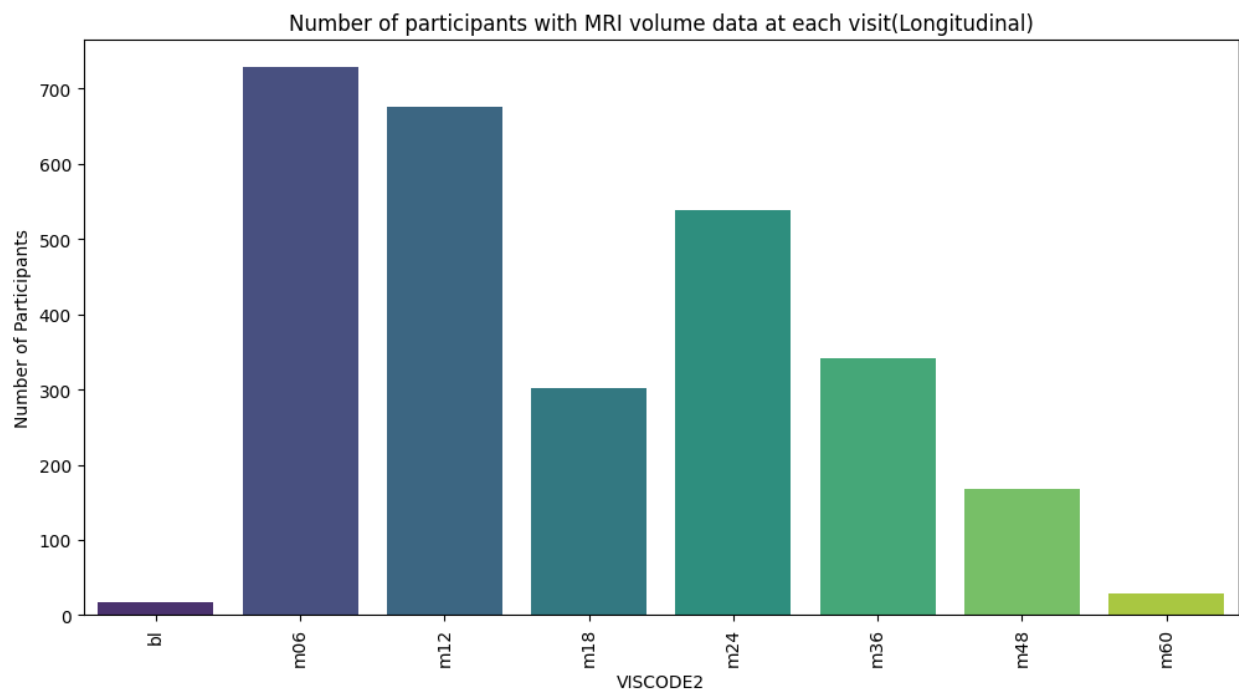
The approaches to issue the scanner changes:

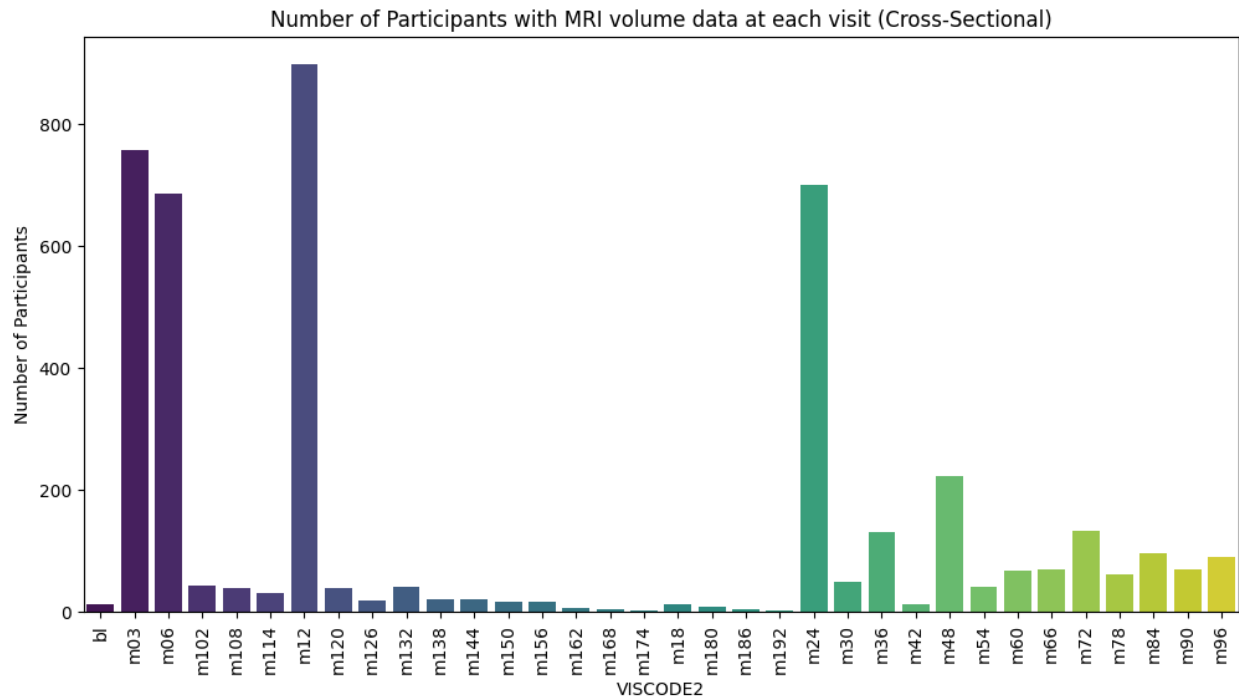
1. Assuming that longitudinal within participant data is not compatible before vs after a change in scanner.
2. Assuming that longitudinal within participant data is not compatible before vs after a major hardware change.
3. Assuming that longitudinal within participant data maybe compatible before vs after a software version change but being advised that this may not be shown to be true eventually for some types of software changes.

However, A study file has the subcortical brain region volumes is available across different ADNI phases:

UCSFFSL – Freesurfer-based MRI measurements derived from a longitudinal analysis (collected across multiple time points for each participant)

UCSFFSX – Represents the same MRI measurements but from a cross-sectional analysis, looking at the data from a single time point for each participant.





Demographics such as: Age, Gender, Education, Ethnicity, Race, Martial status has been considered.

(DX_bl)	Mean Age (±SD)	Gender (Male / Female)	Education (Years, Mean ± SD)	Ethnicity	Race	Marital Status
AD	74.75 ± 7.94	231 / 180	15.22 ± 2.90	Not Hisp/Latino: 393, Hisp/Latino: 15	White: 375, Black: 22, Asian: 10, More than one: 4	Married: 347, Widowed: 39, Divorced: 14, Never married: 11
CN	73.33 ± 6.35	255 / 286	16.41 ± 2.62	Not Hisp/Latino: 514, Hisp/Latino: 25	White: 476, Black: 47, Asian: 13, More than one: 2, Indian/Alaskan: 2	Married: 369, Widowed: 80, Divorced: 58, Never married: 33, Unknown: 1
EMCI	71.20 ± 7.48	227 / 194	16.00 ± 2.65	Not Hisp/Latino: 396, Hisp/Latino: 23	White: 381, Black: 18, More than one: 8, Asian: 7, Indian/Alaskan: 2, Hawaiian/Other: 1	Married: 320, Divorced: 47, Widowed: 30, Never married: 20, Unknown: 4

(DX_bl)	Mean Age (±SD)	Gender (Male / Female)	Education (Years, Mean ± SD)	Ethnicity	Race	Marital Status
<b>LMCI</b>	73.74 ± 7.49	421 / 267	15.97 ± 2.84	Not Hisp/Latino: 661, Hisp/Latino: 24	White: 627, Black: 39, Asian: 12, More than one: 4, Hawaiian/Other: 1, Indian/Alaskan: 1	Married: 533, Widowed: 80, Divorced: 59, Never married: 14, Unknown: 2
<b>SMC</b>	70.58 ± 6.77	133 / 220	16.69 ± 2.33	Not Hisp/Latino: 323, Hisp/Latino: 28	White: 272, Black: 50, Asian: 16, More than one: 12, Unknown: 3	Married: 245, Divorced: 47, Widowed: 39, Never married: 20, Unknown: 2

The MRI brain volume regions from both UCSFFSL and UCSFFSX taken separately, merged with the ADNIMERGE data containing the Insomnia symptoms column to check the Follow-up distribution.

