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2018 National Inmate Survey (NIS-4): Sample Design Evaluation and Recommendations

Technical Plan

Prepared for

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1. Introduction

1.1 Background

The 2018 National Inmate Survey (NIS-4) will be the fourth implementation of the NIS series. The previous iterations of NIS were conducted in 2007 (NIS-1), 2008-09 (NIS-2), and 2011-12 (NIS-3). As shown in ***Table 1***, the victimization rates for the three key outcomes of interest – (1) any sexual victimization, (2) inmate-on-inmate sexual victimization, and (3) staff sexual misconduct – have remained relatively stable across the three NIS iterations.

Table 1. Victimization rates by victimization type and study year

Study Year	Overall Sexual Victimization	Inmate-on-Inmate Sexual Victimization	Staff Sexual Misconduct
NIS-1	4.5%	2.1%	2.9%
NIS-2	4.4	2.1	2.8
NIS-3	4.0	2.0	2.4

Since the last NIS was completed, two changes in the inmate population have occurred that may impact the NIS-4 estimates. First, the PREA standards were introduced. These standards are intended to reduce sexual victimization rates. Second, as described in Section 2, there have seemingly been some changes how the inmate population is housed. For example, there has been an increase in female inmates, but a decrease in the number of female prisons.

In the first three NIS studies, a sample of prisons and jails were drawn and fielded simultaneously. However, the NIS-4 is being modified to field samples of prison and jail inmates consecutively rather than concurrently. As such, this document will focus on the design for the prison sample – the population that will be fielded first.

1.2 Analytic Goals

Given the changes that have occurred since NIS-3, the analysis objectives for NIS-4 will be expanded to potentially measure the impact of these changes. As such, the key analytic goals of NIS-4 will include:

1. Estimating the 2018 sexual victimization rates for the three outcomes of interest with similar precision to past NIS studies
2. Determining whether the sexual victimization rates have changed since prior NIS iterations
3. Estimating the sexual victimization rates among female inmates with similar or better precision than past NIS studies
4. Estimating the 2018 sexual victimization rate among those with a serious psychological disorder (SPD) with similar precision to past NIS studies
5. Estimating the 2018 sexual victimization rate among juveniles held in adult facilities with reasonable precision
6. Enabling the estimation of sexual victimization rates by facility characteristics (e.g., facility size) with reasonable precision

1.3 Purpose of Report

The purpose of this report is threefold. First, it describes the known changes to the U.S prison population and how these impact the universe that will be used to select the NIS-4 sample. Second, it describes the results of assessments of the NIS design to ensure the analytic goals will be achieved. Third, it recommends the optimal design for NIS-4.

2. Population Universe

2.1 Target and Sampling Populations

2.1.1 Target Populations

There are two target populations of interest for the NIS: (1) all adult prison inmates held in confinement facilities, and (2) all juvenile (16-17 year olds[1]) prison inmates held in adult confinement facilities. Inmates held in community-based facilities are not eligible for the NIS because of the amount of time they spend unsupervised. The target population for the NIS-4 will remain unchanged relative to prior NIS studies.

2.1.2 Sampling Population for Adult Inmates

The sampling population for the first three iterations of the NIS used the 2005 Census of State and Federal Adult Correctional Facilities as the basis for defining the prison population. The 2005 Census was the most recent Census conducted at the time of each prior NIS iteration. Because of the amount of time between the Census and the start of NIS-2 and NIS-3, prior to the sample selection for the NIS-2 and NIS-3, the Census frame was supplemented with updated information from websites maintained by each state's department of corrections (DOC) and the Federal Bureau of Prisons (BOP). The supplemental updates focused on identifying and removing closed facilities. Population counts were not updated because they could not be updated for all facilities.

The sampling population for the adult target population in NIS-4 will be the 2012 Census of State and Federal Adult Correctional Facilities – the most recently conducted Census. ***Table 2*** compares the facility and inmate population counts in the 2005 Census and the 2012 Census by jurisdiction, sex housed[2], and whether the facility's primary function is to offer mental health or medical services. The table shows that there has been a shift in how facilities are classified in the respective Censuses. For example, the number of female facilities has decreased from 215 facilities in the updated 2005 Census used for NIS-3 to 143 facilities in the 2012 Census while the number of female inmates has increased from 91,315 inmates in 2005 to 92,205 inmates in 2012. In addition, the number of facilities designated as having a primary function of providing medical or mental health services has decreased from 179 facilities in 2005 (173 state and 6 federal facilities) to 78 facilities in 2012 (72 state and 6 federal facilities).

[1] There are a small number of juvenile inmates less than 16 year's old held in adult facilities. These inmates are considered ineligible for the NIS.

[2] For the NIS a facility is identified as either a male facility or a female facility based on the composition of the inmate population. The assignment for NIS-4 is based on whichever sex comprises the majority of inmates housed (i.e., if 50% or more of the inmates housed are male than the facility is designated a male facility whereas if 50% or more of the inmates are female than the facility is designated a female facility). For prior iterations of the NIS, the sex of the facility was defined as female if all inmates housed at the facility were female and male if the populations housed was mixed or all male.

Table 2. Number of facility and population counts by sex housed and Census year

	Facilities				Population			
	2005		2012		2005		2012	
	Male	Female	Male	Female	Male	Female	Male	Female
Federal	155	39	172	18	184,191	9,799	177,899	11,571
Non-Mental Health	150	38	167	17	178,386	8,320	171,803	10,174
Mental Health	5	1	5	1	5,805	1,479	6,096	1,397
State	982	176	1,157	125	1,136,900	81,516	1,173,661	80,634
Non-Mental Health	852	133	1,093	117	943,239	52,683	1,103,561	74,818
Mental Health	130	43	64	8	193,661	28,833	70,100	5,816
Total	1,137	215	1,329	143	1,321,091	91,315	1,351,560	92,205

Table 3 presents the distribution of prison facilities by the number of inmates housed. As can be seen, even though the overall inmate population has increased from 2005 to 2012, the inmates were housed in smaller facilities in 2012 compared to 2005. For example, the number of facilities with fewer than 500 inmates is 117 more in 2012 than 2005. In addition, the number of extremely large facilities (i.e., those with 4,000 or more inmates) has decreased from 32 in 2005 to 18 in 2012 (with no facilities containing 6,000 or more inmates).

Table 3. Number of facilities and average number of inmates by facility size and frame

	2005 Frame		2012 Frame	
Number of Inmates Housed	No. of Facilities	Average No. of Inmates	No. of Facilities	Average No. of Inmates
1 – 499	448	232	565	220
500 – 999	309	743	281	720
1,000 – 1,999	448	1,392	466	1,403
2,000 – 2,999	92	2,356	108	2,381
3,000 – 3,999	25	3,440	34	3,471
4,000 – 4,999	18	4,402	9	4,433
5,000 – 5,999	6	5,408	9	5,343
6,000 – 6,999	3	6,354	0	0
7,000 – 7,999	3	7,149	0	0
Total	1,352	--	1,472	--

As seen in ***Table 3***, there is a large increase in the number of small (0 – 500 inmates) facilities in the 2012 frame compared to the 2005 frame. ***Table 4*** presents a more detailed distribution smaller prisons by Census year. In 2005, 31% (377 out of 1,214) of the male facilities housed fewer than 500 inmates; however, in 2012, this percentage grew to 37% (497 out of 1,329). The size categories with the greatest increase in facilities between 2005 and 2012 were 50 – 99 inmates (36 in 2005 to 80 in 2012) and 250 – 299 (31 in 2005 to 74 in 2012). Among female facilities the number of small facilities remained roughly

the same (72 in 2005 compared to 68 in 2012). However, in both Census years, as an overall percentage, the percentage of facilities that house females is much larger than the percentage of facilities housing males (52% and 48% of female facilities were small in 2005 and 2012, respectively).

Table 4. Number of facilities and inmates by facility size and Census year

	No. of Male Facilities		No. of Female Facilities		No. of Male Inmates		No. of Female Inmates	
No. of Inmates	2005	2012	2005	2012	2005	2012	2005	2012
0-49	17	31	9	12	396	721	221	366
50-99	36	80	6	7	2,962	6,255	499	654
100-149	97	87	11	7	11,674	10,672	1,457	1,047
150-199	35	54	8	7	5,978	9,243	1,506	1,251
200-249	34	37	6	7	7,543	8,155	1,376	1,640
250-299	31	74	16	7	8,451	20,398	4,411	2,016
300-349	25	29	6	12	8,054	9,325	1,941	3,923
350-499	102	105	10	9	43,744	44,868	4,336	3,843
500-749	134	133	26	29	81,322	79,716	16,275	17,810
750-999	138	103	12	17	122,709	91,580	10,843	14,204
1,000 or more	565	596	28	29	1,028,258	1,070,627	48,450	45,451
Total	1,214	1,329	138	143	1,321,091	1,351,560	91,315	92,205

Table 5 presents the distribution of facilities by their mix of male and female inmates. In general, most facilities (95%) are single gender facilities (i.e., they house males only or females only). Those facilities that have both male and female housing units house primarily male inmates. In past NIS iterations, a "male" facility was defined as any facility with at least one male inmate. However, because there are some mixed gender facilities that are predominantly female, these facilities should be classified as female for stratification purposes. Using a criterion of 50% or more of the population being female, there would be 4,110 female inmates (4.4% of female population) housed in mixed gender facilities assigned to the male stratum.

Table 5. Facility and inmate distribution by percentage of females housed in a facility by Census year

	No. of Facilities		No. of Male Inmates		No. of Female Inmates	
Gender Mix	2005	2012	2005	2012	2005	2012
All Male	1,161	1,257	1,268,363	1,314,546	0	0
1-24% Female	51	65	47,634	32,628	3,458	3,040
25-49% Female	2	7	2,700	2,522	2,049	1,070
50-74% Female	5	5	1,780	1,800	2,722	2,882
75-99% Female	7	1	614	64	8,236	482
All Female	126	137	0	0	74,850	84,731

2.1.3 Sampling Population for Juvenile Inmates

The sampling population for the juvenile target population will consist of facility population counts obtained from DOC websites for the 10 states with the largest juvenile population[3][4] – Arizona, Connecticut, Florida, Georgia, Michigan, North Caroline, New York, Pennsylvania, South Carolina, and Texas. Because the juvenile inmate population was collected through a website review, their population totals are current as of 2016 rather than 2012 as is the total facility population from the Census. ***Table 6*** presents the juvenile population based on the 2005 Census and the current population information. The table shows that the 8 largest states cover about 70% of the juvenile population. Furthermore, the table shows how the juvenile population has decreased 56% (692 inmates in 2016 compared to 1,517 in 2005). Furthermore, the number of facilities holding juveniles has greatly decreased as well – 49 in 2016 compared to 113 in 2005.

Table 6. Sampling population counts for juveniles held in adult prisons, 2005 and 2016

Frame	Number of facilities containing at least 1 Juvenile in 10 largest States	Number of juveniles in 10 largest states	Total juvenile count National Prison Statistics (2014)
2005	113	1,517	2,208
2015	49	692	1,035

2.2 Considerations for Frame Enhancement

2.2.1 Juvenile Facilities

Given the reduction in the number of juveniles held in adult facilities, in order to maximize the participation of juveniles, an important aspect of the NIS-4 design will be to accurately identify facilities that house them. Although initial work was done in the ten states with the largest juvenile incarceration rates through website reviews, additional work can be done to produce more accurate counts. As such, the following frame cleaning steps are recommended:

1. Review DOC websites for all additional states in which the National Prison Statistics (NPS) identifies juveniles being held in adult prisons
2. Contact DOCs to get the most accurate estimate of how many juveniles are held by a state in adult facilities and where the inmates are currently held

2.2.2 Mental Health Facilities

Based on past NIS data, persons with a serious psychological disorder (SPD) are more likely to report being a victim of sexual assault. ***Table 7*** presents, based on NIS-3, the proportion of inmates identified as having an SPD or a lifetime mental health diagnosis within facilities (1) whose primary function is mental health or medical services, and (2) non-mental health facilities, and the sexual assault rates for

[3] The 2012 Census did not collect information on the number of juveniles housed in a facility
[4] Based on the 2014 National Prisoner Statistics – the latest year available.

each. Inmates with SPD or lifetime diagnosis have higher victimization rates than the national average (as seen in ***Table 1***) and, among those with SPD or lifetime diagnosis, the victimization rate is statistically higher among inmates housed in a mental health facility.

Table 7. Severe psychological disorder (SPD) and lifetime mental health diagnosis rates and assault rates in inmates in mental health/medical facilities compared to other inmates, NIS-3

	Mental Health/Medical Facility Inmates*		Inmates from Non-MH Facilities	
	Estimate	Standard Error	Estimate	Standard Error
Inmates with SPD	19.5 %	1.0 %	13.8 %**	0.5 %
Sexual Assault Rate/b	13.8	1.1	9.4 **	0.7
Inmates with Lifetime MH Diagnosis	47.7	2.3	34.6 **	1.3
Sexual Assault Rate/c	8.7	0.6	5.8 **	0.4

* Comparison Group

** Significant Difference

a/ Severe Psychological Disorder defined as a K-6 score of 13 or greater

b/Assault rate conditional on persons indicating they have a SPD based on K-6

c/Assault rate conditional on persons indicating they have a lifetime MH diagnosis

Table 8 presents the distribution of participating NIS-3 facilities whose primary function was mental health or medical services and the sexual assault rate within each set of facilities. As the table shows, the sexual victimization rate increases as the rate of SPD or lifetime diagnosis increases. Furthermore, five of the facilities identified as a mental health or medical facility have SPD rates less than 10%.

Table 8. Number of facilities and assault rate of inmates by SPD and lifetime mental health diagnosis, NIS-3

	Number of facilities	Number of inmates housed	Sexual Assault Rate (%)
SPD Inmates			
0 – 10%	5	8,027	1.6%
11 – 20%	28	55,499	5.1
21 – 30%	25	42,393	7.2
31 – 100%	5	8,100	10.6
Lifetime mental health diagnosis inmates			
0 – 25%	5	10,300	1.4%
26 – 50%	23	51,201	5.3
51 – 75%	30	49,055	7.3
76 – 100%	5	3,463	11.8

Based on the results from NIS-3 and the reduction in facilities in the 2012 Census identified as having a primary mental health or medical function, the following two frame cleaning steps are recommended:

1. Review the entire frame to verify the mental health facility identifier
2. Among those identified as serving a mental health or medical function, identify those that only serve a medical function (e.g., geriatric facilities) and exclude them from the set of facilities identified as serving a mental health function.

2.2.3 Response Rates

Table 9 presents the distribution of sampled inmates by final disposition code in NIS-3 by whether the facility's primary function is mental health services. ***Table 10*** presents the resulting response rates. Overall, NIS-3 obtained a 60.4% response rate. In NIS-1 the response rate was 72% and in NIS-2 the response rate was 71%.

Table 11 presents the distribution of disposition codes for juvenile respondents held in prisons from NIS-3. The resulting response rate for juveniles was 73.5 – significantly higher than for adults. However, as noted in Section 2.1, the number of juveniles held in adult facilities has decreased since NIS-3. Therefore, it is unlikely the same number of juvenile interviews (782 juvenile inmates were sampled, from which 537 interviews were conducted) can be achieved in NIS-4.

Among adults, the response rate was slightly lower in facilities whose primary function is to provide mental health services (57.0% compared to 61.8%). Given these distributions, recommended actions for NIS-4 include:

- Develop additional protocols to more accurately use the disposition code "mentally incompetent – facility's decision". It is likely that this disposition is currently underutilized. Protocols should be developed to instruct the interviewer to find out why an inmate is not being brought to the interviewing room and determine if the reason is that the inmate is not mentally capable of taking the survey.
- Develop protocols to increase the percentage of inmates who meet with the interviewer prior to determining whether to complete the survey

Table 9. Number and percent of sampled inmates by final disposition code and mental health function, NIS-3

		All Inmates		Mental Health Facilities		Other Facilities	
Disposition Code Description	Response Type[1]	Number Sampled	Pct.	Number Sampled	Pct.	Number Sampled	Pct.
Unavailable – off facility grounds	NR	120	0.2	43	0.2	77	0.1
Segregation (non-medical)	NR	65	0.1	35	0.2	30	0.1
In hospital, medical segregation	NR	77	0.1	39	0.2	38	0.1
Unavailable – at facility but not available	NR	92	0.1	34	0.2	58	0.1

Ran out of time at facility	NR	16	0.0	16	0.1	0	0.0
Inmate refused to come to interviewing room	NR	4,011	5.4	1,497	6.9	2,514	4.7
Inmate talked to FI but refused study	NR	19,650	26.3	5,381	24.9	14,269	26.9
Violent inmate – not available for hard copy	NR	217	0.3	52	0.2	165	0.3
Refusal by facility	NR	2,548	3.4	1,370	6.3	1,178	2.2
Inmate being held for other authorities	NR	1	0.0	0	0.0	1	0.0
Inmate left facility before data collection began	IN	1,441	1.9	467	2.2	974	1.8
Inmate left facility after data collection began	NR	1,011	1.4	267	1.2	744	1.4
Inmate left facility – date unknown	NR	73	0.1	11	0.1	62	0.1
Inmate being temporarily held at another facility	NR	98	0.1	16	0.1	82	0.2
Inmate only serves time on weekends	IN	21	0.0	0	0.0	21	0.0
Language barrier – no bilingual at facility	NR	256	0.3	65	0.3	191	0.4
Language barrier (non-Spanish)	IN	65	0.1	17	0.1	48	0.1
Impaired	NR	12	0.0	1	0.0	11	0.0
Mentally incompetent inmate – facility's decision	IN	246	0.3	209	1.0	37	0.1
Mentally incompetent inmate – interviewer decision	IN	122	0.2	45	0.2	77	0.1
Physically unable to complete interview – facility's decision	IN	160	0.2	19	0.1	141	0.3
Physically unable to complete interview – interviewer decision	IN	129	0.2	54	0.3	75	0.1
Inmate transferred to another interviewer	NR	1	0.0	0	0.0	1	0.0
PAPI administration needed	CP	751	1.0	268	1.2	483	0.9
Juvenile in facility that requires parental consent	NR	33	0.0	0	0.0	33	0.1
Sampled in error	IN	8	0.0	2	0.0	6	0.0
Inmate on unsupervised work release	IN	47	0.1	9	0.0	38	0.1
Coded in error	NR	1	0.0	1	0.0	0	0.0
Multiple facilities sampled – unit not worked	IN	49	0.1	0	0.0	49	0.1
Other	NR	354	0.5	114	0.5	240	0.5
Complete	CP	42,359	56.7	11,372	52.6	30,987	58.4

Breakoff – facility initiated	CP	43	0.1	16	0.1	27	0.1
Breakoff – inmate initiated	CP	521	0.7	155	0.7	366	0.7
Mentally incapable break off	CP	35	0.0	17	0.1	18	0.0
Computer malfunction break off	CP	12	0.0	3	0.0	9	0.0
Underage break off	IN	2	0.0	1	0.0	1	0.0
Age not obtained	IN	8	0.0	4	0.0	4	0.0
Total sample		74,655	100	21,600	100	53,055	100

[1] Response type: CP=completed interview, NR=eligible nonrespondents, IN=ineligible

Table 10. Inmate-level response rate among adult inmates by mental health facility type, NIS-3

Inmate type	Response rate[1]
All inmates	60.4
Inmates housed in mental health facilities	57.0
Inmates housed in non-mental health facilities	61.8

[1] The response rate is computed as R=CP/(CP+NR) using the response type in ***Table 9***

Table 11. Distribution of disposition codes for juveniles held in adult prisons, NIS-3

Description	Response Type	Number Sampled	Percent
Unavailable – off facility grounds	NR	2	0.3
Inmate refused to come to interviewing room	NR	20	2.6
Inmate talked to FI but refused study	NR	105	13.4
Violent inmate – not available for hard copy	NR	23	2.9
Refusal by facility	NR	11	1.4
Inmate left facility before data collection began	IN	10	1.3
Inmate left facility after data collection began	NR	10	1.3
Mentally incompetent inmate – interviewer decision	IN	1	0.1
PAPI administration needed	CP	18	2.3
Juvenile in facility that requires parental consent	NR	32	4.1
Other	NR	1	0.1
Complete	CP	537	68.7
Breakoff – inmate initiated	CP	10	1.3
Underage break off	IN	2	0.3
Total:		782	100

[1] Response type: CP=completed interview, NR=eligible nonrespondents, IN=ineligible

3. NIS-4 Design Considerations

The NIS-4, like its prior iterations, will maintain the basic design considerations detailed in the PREA legislation. These considerations include:

- Ability to make facility level estimates
- At least one facility in each state be included in the sample

- A sample of at least 10% of all facilities be selected

Given these considerations and the analytic objectives detailed in Section 1.2, in order to minimize the impact that the design has on the ability to compare estimates over time, it is recommended that the basic sample design remain unchanged. That is, a two-stage PPS design whereby a stratified sample of facilities is selected with probability proportional to the number of inmates housed in the first stage and a simple random sample of inmates is selected in the second stage is maintained. However, to maximize the likelihood that the analytic objectives are met, the design parameters were evaluated to determine their optimal values. The design parameters evaluated were:

1. Oversampling factor applied to female facilities
2. Selection method for juveniles

In this section, the methods and results of a simulation study are presented in which different design parameters were considered in an effort to determine which best achieved the analytic objectives.

3.1 Basic Design for Simulation

3.1.1 First-stage sample size

As stipulated by Bureau of Justice Statistics, the total number of facilities to be sampled will be fixed at 270 facilities. A subset of these facilities will be designated to sampling the juvenile portion of facilities. That is, the juvenile set of inmates within a facility will be stratified and selected independently from the adult portion of the facility. Section 3.1.7 describes the number and manner of the juvenile facility sample selection. The number of facilities from which an adult sample is selected will equal 270 minus the number designated to the juvenile sample.

This first-stage sample size is an increase over prior NIS studies where 146 prisons participated in NIS-1, 167 in NIS-2, and 233 facilities in NIS-3. The increase in the facility sample size is to assist with the assessment of trend in the sexual victimization rate.

3.1.2 Stratification

The NIS-4 simulation design to sample adult inmates begins with 8 strata based on the following characteristics:

- Jurisdiction: state or federal
- Sex housed[5]: male or female
- Mental health primary function: yes or no

This initial stratification is slightly different than prior NIS designs in that jurisdiction is an explicit stratum. In prior NIS designs, federal facilities were treated like a state and ensured at least one facility in the sample.

Based on this initial stratification, self-representing facilities (i.e., facilities whose expected probability of selection was greater than one) were identified and placed in a stratum. Once the self-representing facilities were identified, within the state, male, non-mental health stratum (the largest stratum) the expected number of facilities to be selected within each state is computed. If the expected number is less than one, then the facilities from those states are put into a state-specific stratum (e.g., if there are

[5] Assigned based sex of majority of inmates housed

k states with an expected sample size of less than one facility, then k additional strata are created). Thus, the final design will have 8 + 1 + k strata.

3.1.3 Oversampling of Female Facilities

As seen in ***Table 2***, the female population makes up 6.4% of the total prison population in 2012. This is virtually unchanged from 2005 when the female population made up 6.2% of the total population. As seen in past NIS studies, the sexual victimization rate among females is different than males. For example, in NIS-3 the inmate-on-inmate sexual victimization rate was 1.7% among males, but 10.7% among females. Therefore, a continued analytic goal is to produce precise estimates among female inmates.

In prior NIS studies, an oversampling factor of 5 was applied to the size measure of female facilities (i.e., the population size) when determining the number of facilities to be allocated to the female stratum. In the simulation study we assess three oversampling factors to determine, given the larger first-stage sample size, the best oversampling factor to achieve the analytic objectives. The three oversampling factors considered are: 4, 5, and 7.

3.1.4 Allocation of Facilities to Strata

In order to ensure an adequate number of facilities whose primary function is mental health services, the same approach used in NIS-3 will be used for the NIS-4 simulation. In NIS-3 a set aside of 25 facilities was allocated to the mental health facility strata.

3.1.5 Facility Allocation

The allocation of facilities to strata will be implemented as follows:

1. The non-mental health set aside (i.e., the final adult sample size minus 25) is proportionally allocated to the 8 explicit strata based on the facility size measure (i.e., taking into account the female oversampling factor).
2. The 25 facility mental health set aside is proportionally allocated to the 4 mental health strata and added to the non-mental health set aside allocation.
3. After removing self-representing facilities, within the male, state, non-mental health stratum, states where the expected number of facilities to be selected is less than 1 (i.e., $m_h S_s / S_{h+} < 1$where S_s is the total size measure for all facilities in state *s*) are identified and assigned to their own state-specific stratum. The sample size for each of these stratum is assigned to 1. If there are k such states, the sample size for the remaining male, state, non-mental health stratum is reduced to $m'_h = m_h - k$.
4. Within each stratum, self-representing facilities (i.e., facilities where $m_h S_i / S_{h+} > 1$ where m_h is the facility sample size in stratum *h*, S_i is the size measure for facility *i*, and S_{h+} is the total size measure in stratum *h*) are identified and assigned to a certainty stratum.

3.1.6 Assessing Trend

In order to assess trend, victimization rates were randomly assigned to each facility on the frame. These rates were assigned using a beta distribution. The beta distribution, produced for each of the three key outcomes, used the facility-level sexual victimization rates from the three prior NIS studies and was conditioned on the jurisdiction type, sex of inmate housed, and whether the facility serves a mental health function. A simulation of 1,000 samples was conducted. For each iteration of the simulation, design-based weights for the first and second-stage were computed. Furthermore, each iteration of the

simulation had the three victimization rates produced using the design-based weights for each sampled facility. To compute proper standard errors a design effect of the design effect due to clustering was computed for each of the three outcomes based on NIS-3 responses. These design effects were 2.63 for overall sexual victimization, 1.68 for inmate-on-inmate victimization, and 3.38 for staff sexual misconduct. The design effect for unequal weighting was taken into account through the inclusion of the survey weights in the estimation process.

To assess the power with which the NIS-4 estimates will be able to detect a difference from prior NIS studies, the beta distributions for the victimization rates were shifted down from 99% of the randomly assigned victimization rate to 60% of the randomly assigned victimization rate. For each of the 1000 simulation iterations, a z-test, assuming independence between the NIS-4 and NIS-3 estimate, was computed. The proportion of times a difference at the 95% confidence-level was detected was computed. For each victimization type, 80% power was achieved when a detectable difference was achieved in 80% of the simulation runs.

3.1.7 Juvenile Allocation and Sample

As demonstrated in ***Table 3***, the population of juveniles held in adult facilities is skewed to a small set of states. Furthermore, within these states, juveniles are concentrated in a small set of facilities. Leveraging the clustered nature of where juveniles are housed, the following rules will be considered to determine the number of facilities that will be assigned to the juvenile portion of the population.

1. Within the 10 states with the largest juvenile population, select the facility with the largest juvenile population with certainty
2. Within the 10 states with the largest juvenile population, select all facilities with 30 or more juveniles
3. Within the 10 states with the largest juvenile population, select all facilities with 20 or more juveniles
4. Within the 10 states with the largest juvenile population, select all facilities with 10 or more juveniles

Based on these rules, ***Table 12*** presents the number of facilities that would be allocated to the juvenile stratum.

Table 12. Number of facilities selected by juvenile sample design option

Decision rule	Number of facilities selected
Largest in state	10
Greater than 30 juveniles housed	8
Greater than 20 juveniles housed	10
Greater than 10 juveniles housed	14

In addition to the facilities selected with certainty, if a facility selected under the adult facility sample (other than the facilities identified under the specified decision rules) contains a juvenile, that juvenile will be included in the sample.

For facilities in which at least one juvenile is identified on the roster, the juvenile inmates will be placed in their own sampling stratum. All juveniles will be selected with certainty. If the adult portion of the

facility was also sampled, the juvenile sample size will not influence or alter the facility sample size of adults. In other words, the juvenile inmate sample will be in addition to the adult sample.

3.2 Results of Simulation

3.2.1 Oversample of Females

Table 13 presents the allocation to the 8 explicit strata by female oversampling factor when 10 facilities are assigned to the juvenile stratum (i.e., the adult facility sample size is 260). The number of female facilities increases from 55 when the oversampling factor is 4 to 66 when the oversampling factor is 5 and 84 when the oversampling factor is 7.

Table 13 Allocated sample size to explicit strata by female oversampling factor

	Male Facilities		Female Facilities	
Oversampling Factor	State	Federal	State	Federal
4	180	25	49	6
5	171	23	58	8
7	155	21	74	10

Table 14 presents the expected respondent sample size by gender and jurisdiction for each oversampling factor. In total, around 50,000 respondents are expected in the NIS-4 design. The number of female respondents increases from 9,950 when the oversampling factor for females is 4 to 14,782 when the oversampling factor for females is 7.

Table 14. Expected number of respondents by gender housed, jurisdiction and female oversampling factor

	Male Facilities			Female Facilities		
Oversampling Factor	State	Federal	Total	State	Federal	Total
4	35,720	4,965	40,684	8,876	1,074	9,950
5	33,911	4,566	38,477	10,420	1,431	11,851
7	30,707	4,172	34,879	13,003	1,779	14,782

Table 15 presents the average number of facilities sampled in prior NIS studies by female oversampling factor. As the NIS iteration increases, the number of previously sampled facilities increases from around 48 in NIS-1 to 78 in NIS-3. This is due to the larger facility sample size in each iteration. As the oversampling factor increases, the number of previously selected facility increases. Although, the range of the increase is small – between 2 and 3 facilities.

Table 15. Average number of previously sampled facilities by female oversampling factor and prior NIS study

Oversampling Factor	NIS-1	NIS-2	NIS-3
4	48.9	54.2	77.2
5	48.3	56.2	78.6
7	47.4	57.9	79.4

Table 16 presents the relative standard errors (RSE) by gender and victimization type for each of the three oversampling factors considered. As expected, when the female oversampling factor increases, the RSE for males increases while the RSE for females decreases. The increase in precision for the female estimates is about 10% when the oversampling factor increases from 5 to 7.

Table 16. Relative standard errors by female oversampling factor, victimization type and gender

	Overall sexual victimization		Inmate-on-inmate		Staff sexual misconduct	
Oversampling factor	Males	Females	Males	Females	Males	Females
4	6.5	10.2	6.3	7.5	10.2	21.8
5	6.7	9.5	6.5	7.0	10.5	20.2
7	7.1	8.6	6.8	6.4	11.0	18.4

Table 17 presents the unequal weighting effects (UWEs) – based on the design-based weights[6] – that each oversampling factor will produce. The UWE increases 5% when going from an oversampling factor of 4 to 5 and 9% when going from an oversampling factor of 5 to 7.

Table 17. Unequal weighting effects (UWE) due to oversampling female facilities

Oversampling Factor	UWE
4	1.265
5	1.333
7	1.452

Table 18 presents the expected number of facilities and expected number of respondents by the size of the facility and the female oversampling factor. Due to the fact that female facilities are smaller than male facilities, as the oversampling factor increases the distribution of facilities by size of facility shifts towards smaller facilities. Regardless of the oversampling factor, it is likely that the resulting sample sizes can support estimates for the smaller three size categories. However, for facility sizes of 3,000 inmates or more, collapsing of the facility size may be necessary to produce estimates with reasonable precision.

[6] The simulation did not simulate nonresponse or coverage error. Therefore, the UWEs presented understate the final UWE once the nonresponse and coverage adjustments are factored into the survey weights.

Table 18. Number of facilities and average respondent sample size by size of facility and female oversampling factor

	Oversampling Factor: 4		Oversampling Factor: 5		Oversampling Factor: 7	
Size of facility (Number of inmates)	Number of facilities	Average respondent sample size	Number of facilities	Average respondent sample size	Number of facilities	Average respondent sample size
0 – 1000	79	12,665	85	13,504	97	15,515
1000 – 2000	112	22,861	110	22,481	103	21,063
2000 – 3000	40	8,596	38	8,165	34	7,452
3000-4000	17	3,844	16	3,660	15	3,353
4000-5000	5	1,179	5	1,098	4	985
5000-6000	7	1,489	6	1,420	6	1,292

3.2.2 Assessing Trend

Table 19 presents the maximum victimization rate that could be estimated in NIS-4 to allow a significant difference with 95% confidence to be detected with 80% power by female oversampling factor. For overall sexual victimization, the 4.0% sexual victimization rate estimated in NIS-3 would need to decrease 18% to 19% in order to detect a significant difference. In other words, the NIS-4 rate can be no greater than 3.52% to detect a significant decrease. Similarly, for the inmate-on-inmate victimization and staff sexual misconduct the NIS-4 victimization rate can be no greater than 1.87% and 1.5%, respectively.

Table 19. Minimum relative change in the NIS-3 victimization rate to detect a significant difference in NIS-4

	Overall sexual victimization		Inmate-on-inmate		Staff sexual misconduct	
Oversampling factor	NIS-3 Victimization Rate	Minimum Relative Change to Detect a Difference	NIS-3 Victimization Rate	Minimum Relative Change to Detect a Difference	NIS-3 Victimization Rate	Minimum Relative Change to Detect a Difference
4	4.0%	18%	2.4%	20%	2.0%	25%
5	4.0	19	2.4	22	2.0	26
7	4.0	18	2.4	24	2.0	26

3.2.3 Mental Health Facilities

Table 20 presents the expected number of facilities whose primary function is mental health services and the expected number of respondents from those facilities by female oversampling factor. As can be seen in ***Table 2***, there are fewer mental health facilities that are designated as female. Therefore, as the female oversampling factor increases, the expected number of mental health facilities decreases from 38.6 when the oversampling factor is 4 to 34.7 when the oversampling factor is 7. The number of

responding inmates from these facilities decreases by about 800 respondents when the oversampling factor increases from 4 to 7.

Table 20. Expected number of mental health facilities and the expected number of responding inmates by female oversampling factor

Female Oversampling Factor	Number of facilities	Average number of responding inmates
4	38.6	7,324
5	37.8	7,162
7	34.7	6,566

3.2.4 Juveniles

Table 21 presents the number of expected number of facilities in which a juvenile will be found and the expected number of juvenile respondents by juvenile design option. Across the 4 options, 319 – 361 juvenile respondents are expected. This respondent sample size constitutes about half of the juveniles in the 8 states with the largest juvenile population.

Table 21. Expected number of facilities with juvenile inmates and juvenile respondents by juvenile design option

Design	Juvenile Facilities from Self-Representing Stratum	Total number of Juvenile Facilities sampled via PPS	Total number of Juvenile Facilities Sampled	Average Number of Juvenile Respondents
Largest State	10	14	24	325
Greater than 30 juveniles	8	15	23	319
Greater than 20 juveniles	10	14	24	340
Greater than 10 juveniles	14	13	27	361

Based on the results of the simulation, ***Table 22*** presents the expected RSE for each outcome by design option. Under all design options the RSEs are poor indicating that any estimates produced will not be reliable.

Table 22. Relative Standard Errors (RSEs) among Juveniles in Prisons for Victimization Outcomes

	Relative Standard Errors		
Design	Overall Sexual Victimization	Inmate-on-inmate	Staff Sexual Misconduct
Largest state	79.6	82.8	152.8
Greater than 30 juveniles	86.4	88.7	167.4
Greater than 20 juveniles	86.5	89.7	126.3
Greater than 10 juveniles	87.3	80.0	161.2

4. Design Recommendations

Based on our evaluation of the prior NIS survey designs and the NIS-4 analytic objectives, the following section provides recommendations for the NIS-4 design in the areas of (1) frame construction, (2) data collection protocol, and (3) sample design.

4.1 Frame Construction

Our evaluation found that the 2012 Census of State and Federal Adult Prisons has some significant differences from the 2005 Census which was previously used as the frame for the NIS-1, NIS-2, and NIS-3 studies. As such the following recommendations are made regarding the frame.

- The 2012 Census is used as the basis for the frame
- Facilities with fewer than 100 inmates should be verified to ensure they are a confinement facility
- Given the time lapse between the 2012 Census and NIS-4, a thorough review of the universe file should be conducted. The steps involved in this review will includes
    - Determine if any facilities have closed or any new facilities opened via DOC website review
    - Verify confinement facility indicator via DOC website review
    - Verify mixed gender facilities are still housing both genders
    - Verify indicator for a facility having primary mental health.
- The identifier indicating if a facility's primary function is to provide mental health services should be reviewed and updated; DOCs should be contacted to confirm which facilities have primary function of mental health services.
- All states in which the latest NPS report indicates at least one juvenile is housed in an adult facility should be reviewed through DOC websites or contacting the DOC directly to get the most accurate information

4.2 Data Collection Protocols

The recommendations related to the data collection protocol address areas which will help make the sample design more efficient. To that end, the main areas of recommendation in this report cover (1) response rates and (2) the ability of interviewers to assign the most appropriate disposition code.

- For sample size calculations, a response rate assumption of 60% should be used (70% was used in NIS-3)
- To maximize participation by inmates, current protocols should be strengthened to try and get all inmates to come to the interviewing room before determining if they will take the survey or not
- Expanded use of PAPI for inmates who cannot take the survey via ACASI
- Protocols to better determine if an inmate is unable to take the survey due to mental incapacity
- Post-survey adjustments to better account for inmates with a mental health condition (i.e., SPD or lifetime diagnosis) should be explored
- Given the small number of juveniles, additional protocols should be developed to maximize participation of these inmates

- Explore with DOCs and facilities the use of incentives including non-traditional incentives (e.g., gameification)

4.3 Sample Design

The following recommendations are made for the NIS-4 sample design to increase the likelihood of achieving the analytic goals of the study.

- The basic two-stage design with an initial set of 8 explicit strata should continue.
- For purposes of stratification, a "female facility" should be defined based on whether the percentage of inmates housed in the facility is 50% or more of the total facility population.
- The within facility sample size formula should remain the same as NIS-3 with the exception of the response rate assumption which should be changed to 60% (as noted above).
- The female oversampling factor should remain at 5. Even though more facilities will be included in the NIS-4, based on our simulation results, a decrease in the oversampling factor appears to (1) have a negative effect on the precision of estimates for females, (2) reduce the number of previously selected facilities, and (3) produce higher RSEs for key estimates among female inmates. A lower oversampling factor does not appear to have much influence on the overall power to detect differences over time. Also, a smaller oversampling factor increase the number of large facilities included in the sample and, therefore, increases the expected respondent sample size. Similarly, an increase to the oversampling factor seems to have more negative effects than positive. These negative effects will (1) reduce the number of previously selected facilities included in the sample, (2) reduce the number of mental health facilities included in the sample, and (3) reduce the number of large facilities included in the sample. The ability to detect change over time is not greatly impacted by the larger oversampling factor.
- The ability to detect change compared to NIS-3 will be difficult given the previously low rates of victimization. Additional methods or approaches for increasing the within facility respondent sample size – beyond assuming a lower response rate – should be explored.
- For selecting the self-representing juvenile facilities, the approach based on identifying facilities with more than 20 juveniles should be used. Methods that included more facilities did not generate significantly more juvenile responses (only 20 additional responses) and detracted from the adult sample.
- Precision for the juvenile prison sample will be limited. Therefore, other methods to augment the survey data or increase the sample size – through increased response rates or other methods – should be explored.