CDCB's Genotyping Laboratory Certification Program

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Interbull Annual Meeting

June 23, 2019 – Cincinnati, OH

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Overview

- Impact of recent technological advances
  - Large number of animals genotyped at a relatively low cost
  - Massive amount of data that should be collected and analyzed
- Results depend on the quality of the input data
  - Data obtained from different types of chips and under two distinct technologies
  - CDCB exchanges data with many different organizations
  - The data must be scaled and standardized to make them comparable
- Maintaining the integrity of the CDCB database requires a robust quality control (QC) program
  - CDCB developed a customized QC program according to its requirements

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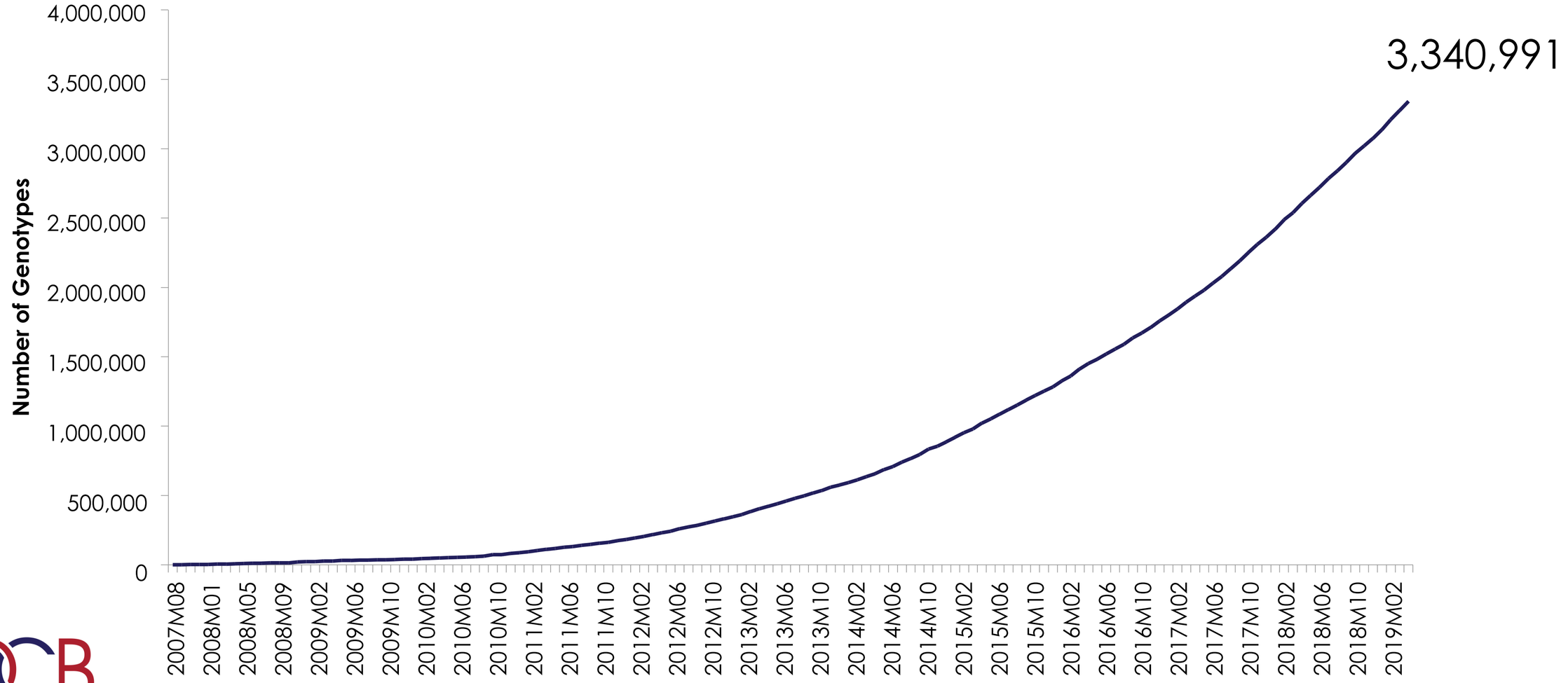
Genotypes in CDCB Database



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Purpose of the laboratories QC program

Ensure the accuracy and uniformity of all records included in the national genomic evaluation

- Monitor certified laboratories performance regularly to ensure quality of data
- Detect the needs or issues experienced by laboratories
- Advise or find solutions for issues/concerns faced by labs
- Facilitate the exchange of data (in the most efficient way)
- Improve communication between labs and the CDCB

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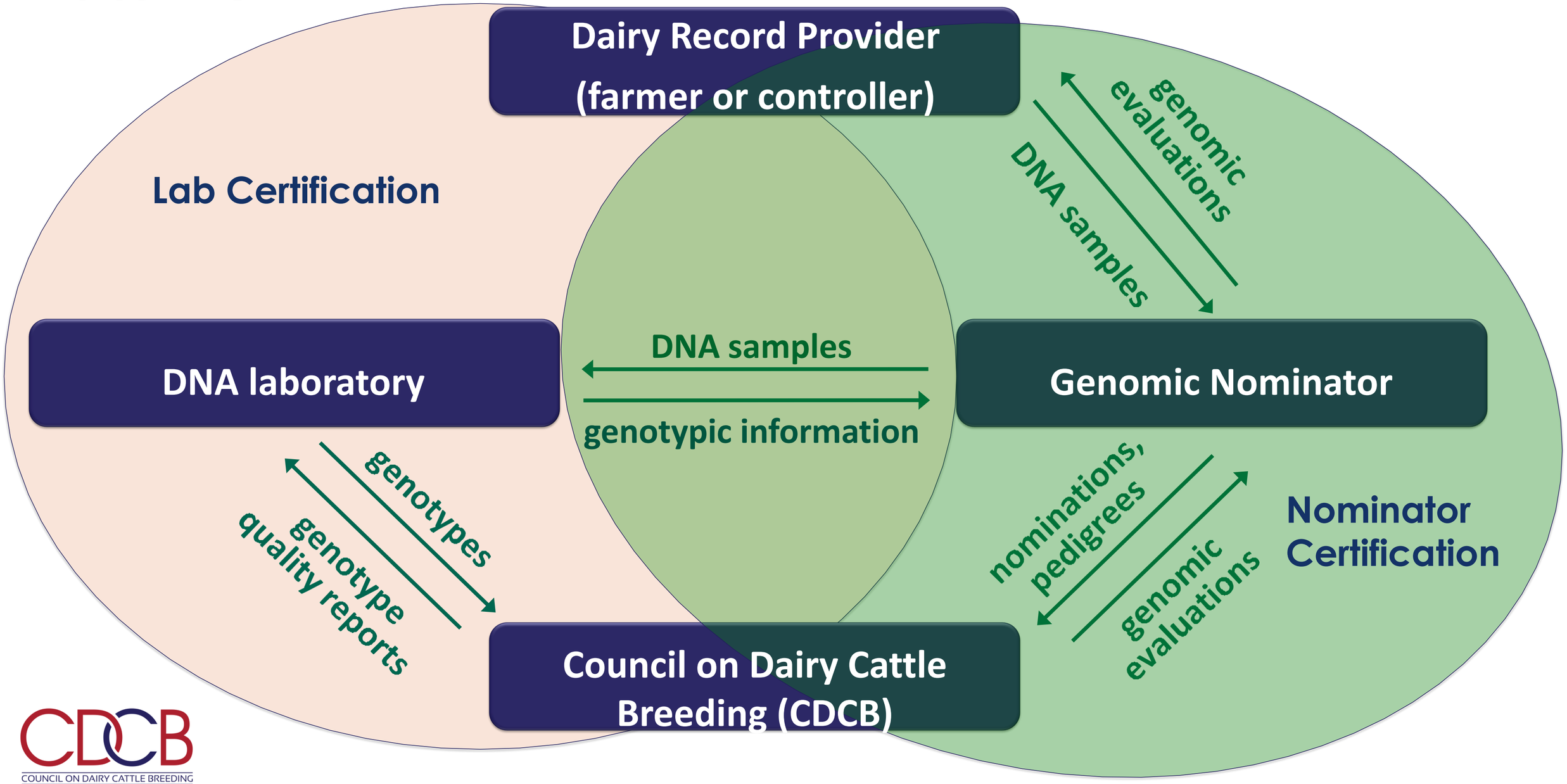
Data flow



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CDCB - Certification Process

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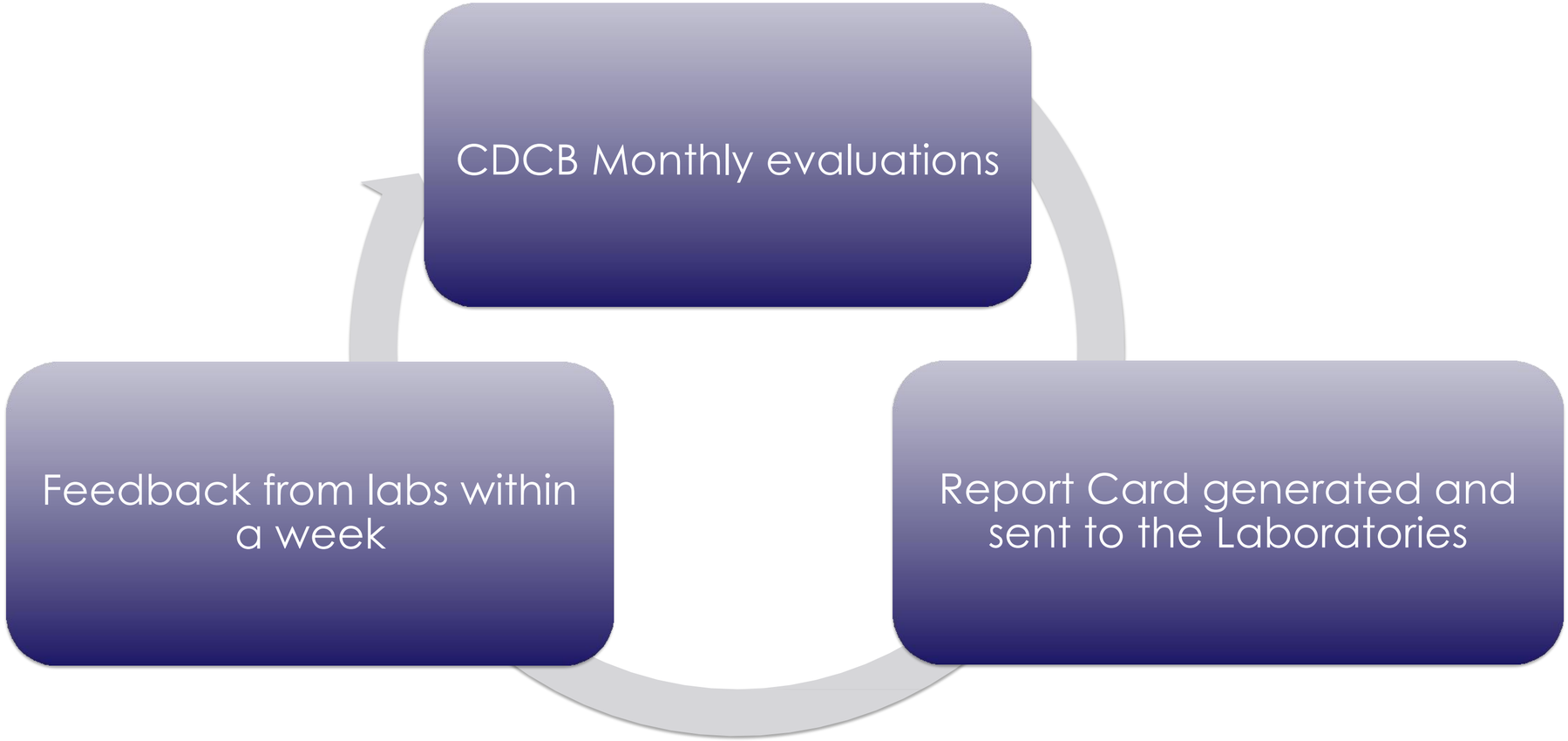
Monthly Report Cards



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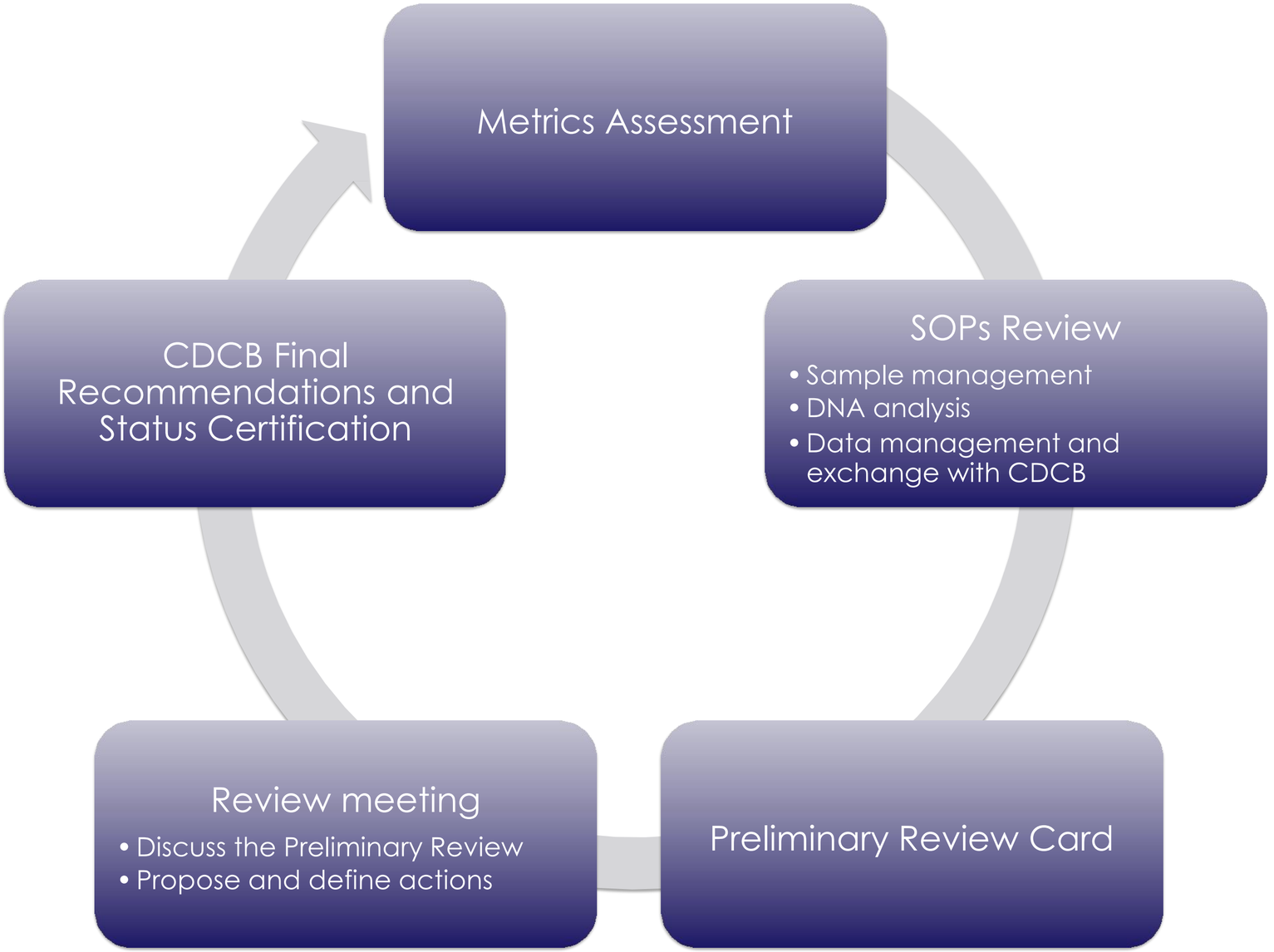
Annual Review Plan



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QC Metrics in Monthly Report Cards

- Metrics are classified according to their impact on the quality and processing of the data

Critical	Submissions with fewer than 10 animal genotypes (10%)
	Submissions failing on SNP call rate (50%)
	Submissions failing on SNP parent-progeny conflicts (25%)
	Submissions flagged on Hardy-Weinberg equilibrium (HWE) (50%)
Major	Percentage of animal genotypes with No Nomination (3%)
	Submissions failing on excessive conflicts per chip (10%)

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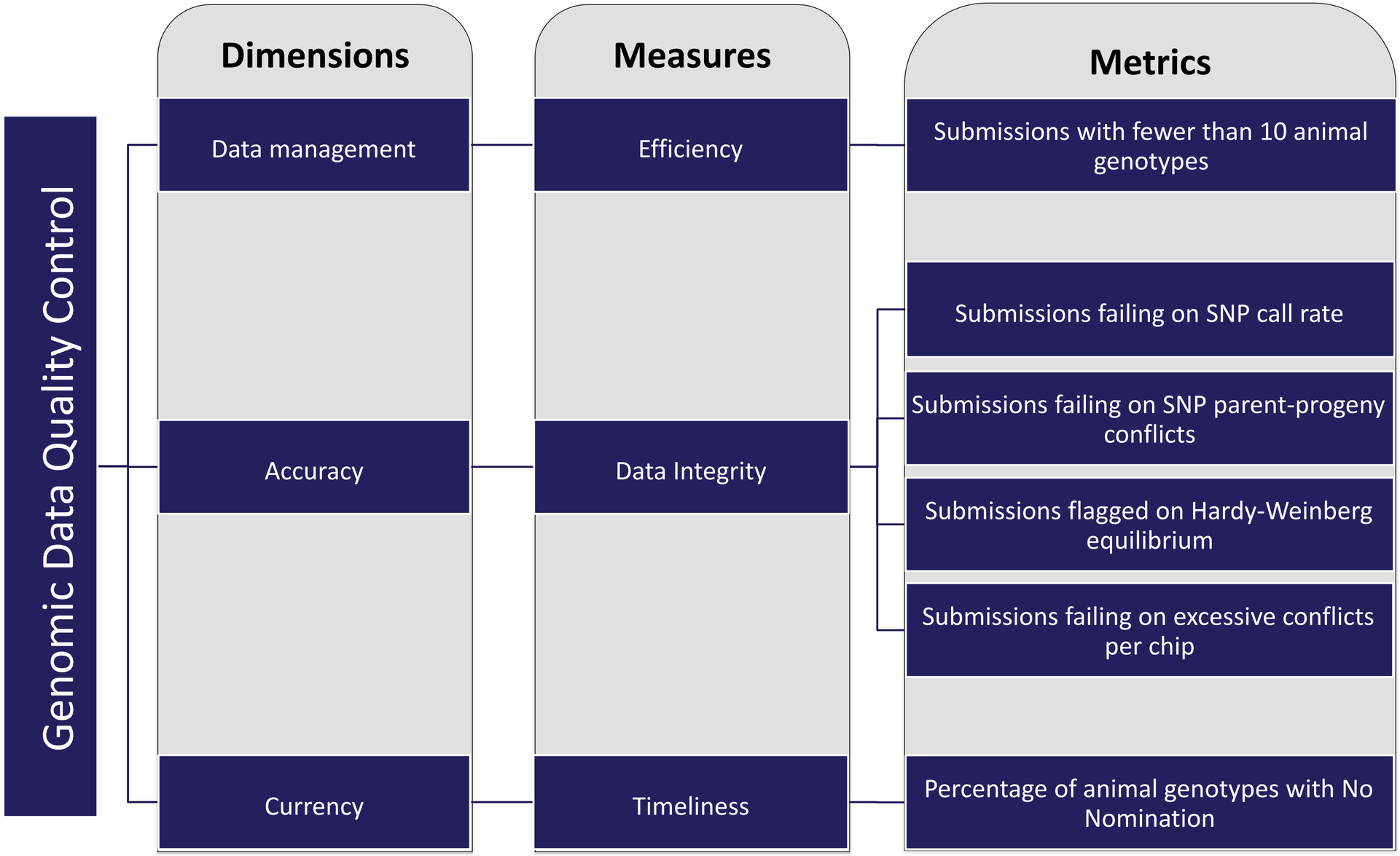

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Performance Metrics Assessment

Lab performance metrics for XX

	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Total Files Processed	78	54	50	58	52	59	57	44	60	46	49	58
Submissions with fewer than 10 animal genotypes	15	8	5	4	4	11	2	8	3	5	8	6
Submissions failing on SNP call rate	39	24	25	25	19	30	0	29	42	32	30	37
Submissions failing on SNP parent-progeny conflicts	11	10	9	3	1	2	0	2	0	1	1	3
Submissions failing on HWE	3	4	6	2	4	1	0	5	1	0	3	2
Percentage of animal genotypes with No Nomination	0	0	0	0	0	0	0	0	0	0	0	0
Submissions failing on excessive conflicts per chip	45	27	11	18	10	7	0	13	17	10	13	15

	Thresh	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Submissions with fewer than 10 animal genotypes	10%	19.23%	14.81%	10.00%	6.90%	7.69%	18.64%	4.23%	18.18%	5.00%	10.87%	16.33%	10.34%
Submissions failing on SNP call rate	50%	50.00%	44.44%	50.00%	43.10%	36.54%	50.85%	61.97%	65.91%	70.00%	69.57%	61.22%	63.79%
Submissions failing on SNP parent-progeny conflicts	25%	14.10%	18.52%	18.00%	5.17%	1.92%	3.39%	8.45%	4.55%	0%	2.17%	2.04%	5.17%
Submissions failing on HWE	50%	3.85%	7.41%	12.00%	3.45%	7.69%	1.69%	7.04%	11.36%	1.67%	0%	6.12%	3.45%
Percentage of animal genotypes with No Nomination	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Submissions failing on excessive conflicts per chip	10%	57.69%	50.00%	22.00%	31.03%	19.23%	11.86%	18.31%	29.55%	28.33%	21.74%	26.53%	25.86%
Percentage of animal genotype reassigned		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

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Check points during submissions

Genotype submission

- Sample Sheet file
- Final Report file

Check Program

Data QC file generated and deliver to the lab

- Lab check the genomic data based on the reports
  - If OK, upload the genotype
  - If not, correct the identified issue and re-start the process

Genotype uploading

Data stored in the CDCB database &

QC reports delivered to Lab and nominator

- **Nominators**
  - Genomic conflicts
  - Genomic errors
  - Parentage
  - Nominator report
- **Laboratories**
- Key not found
- No nomination
- No match sample
- Count.gt
- HWE
- Low call
- DataQC
- Genomic errors

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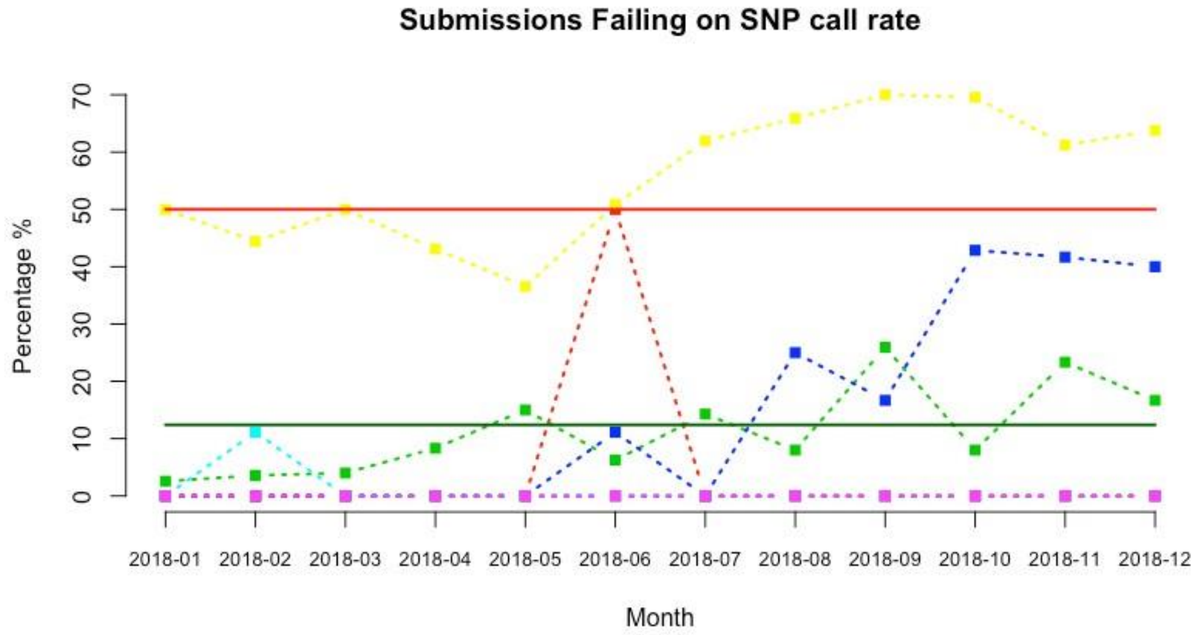
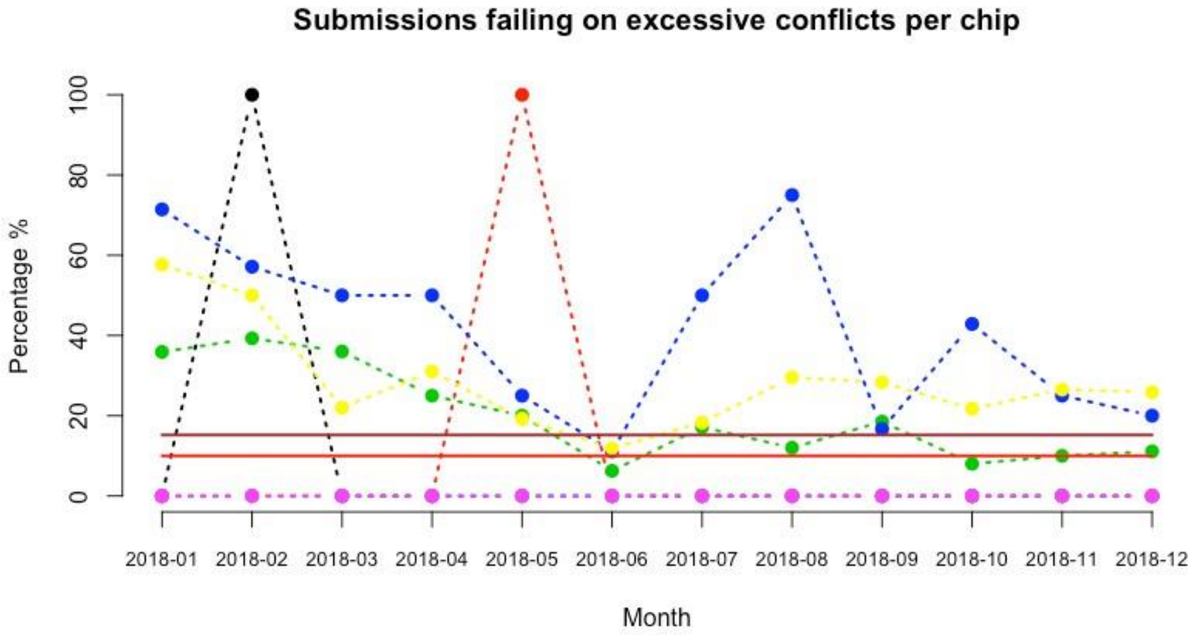
Performance metrics (Examples)





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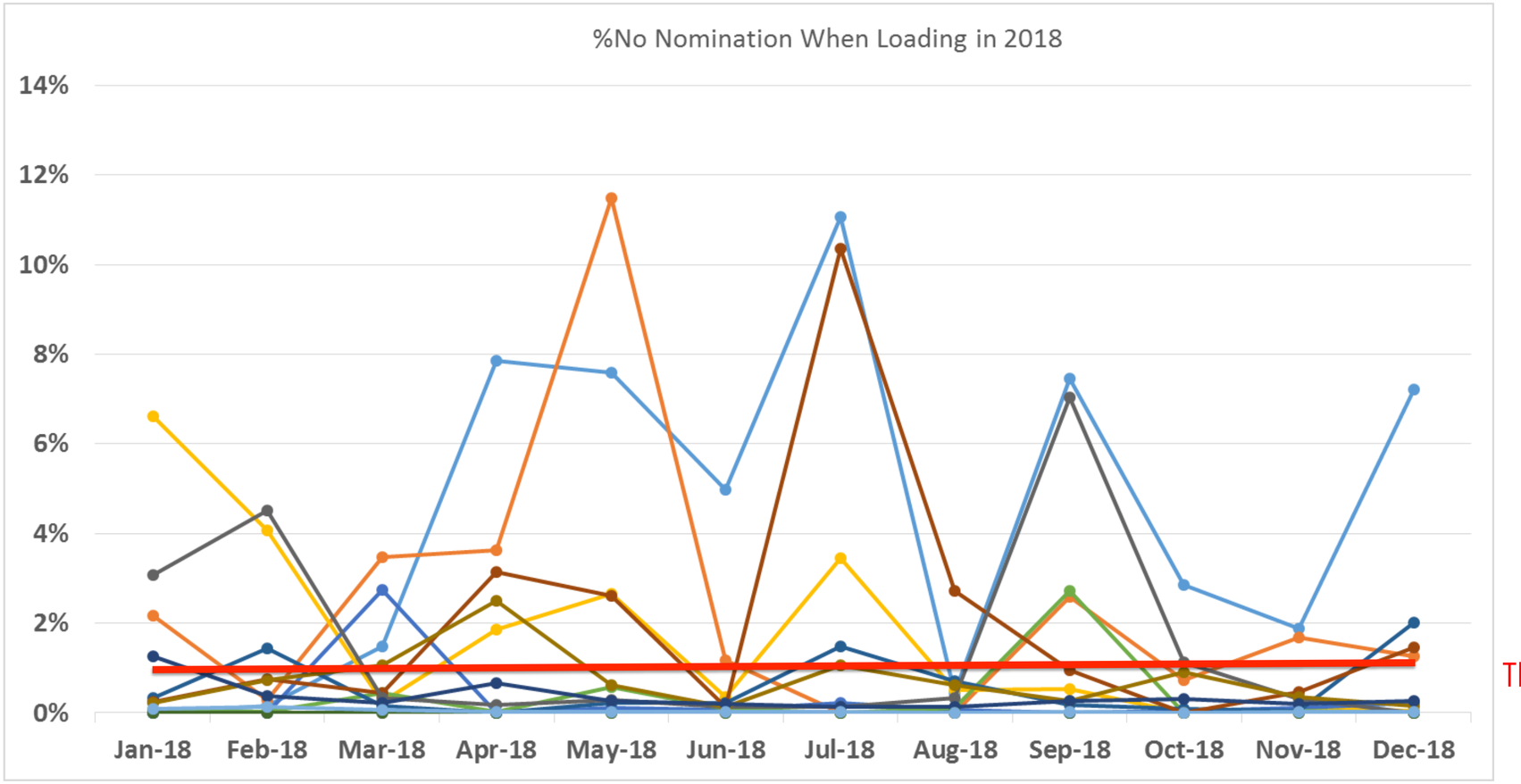
Nominators' performance (Example)



Threshold= 1%

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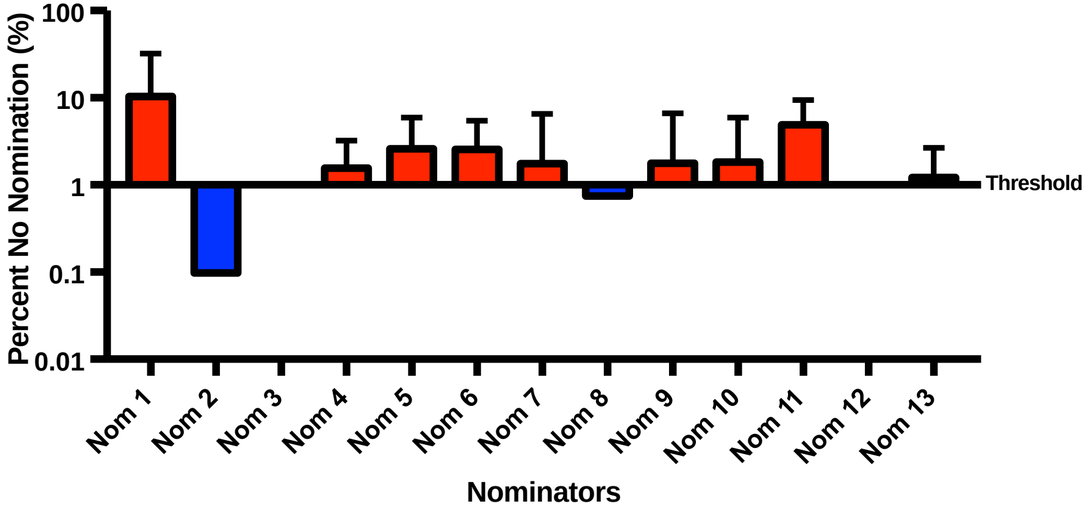
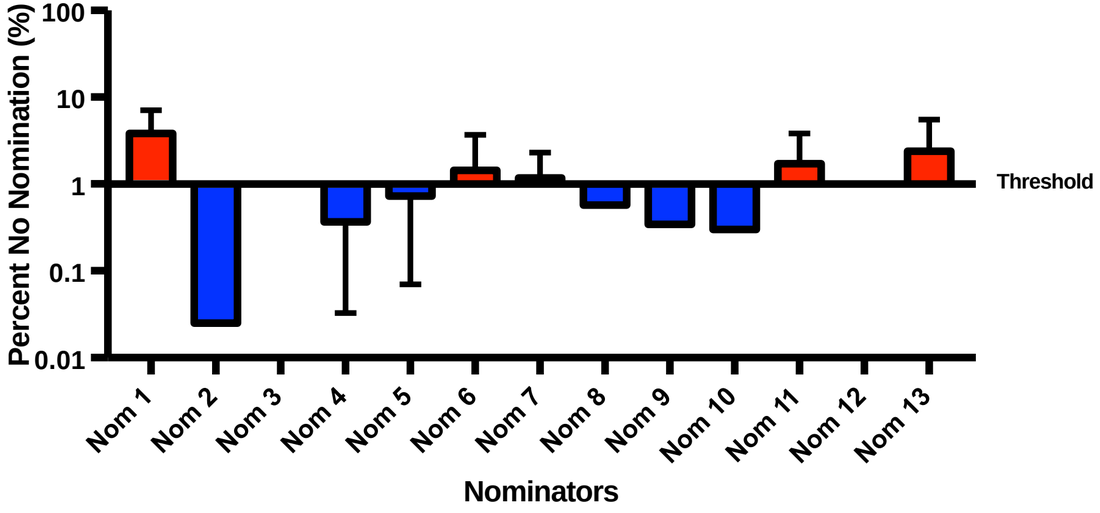
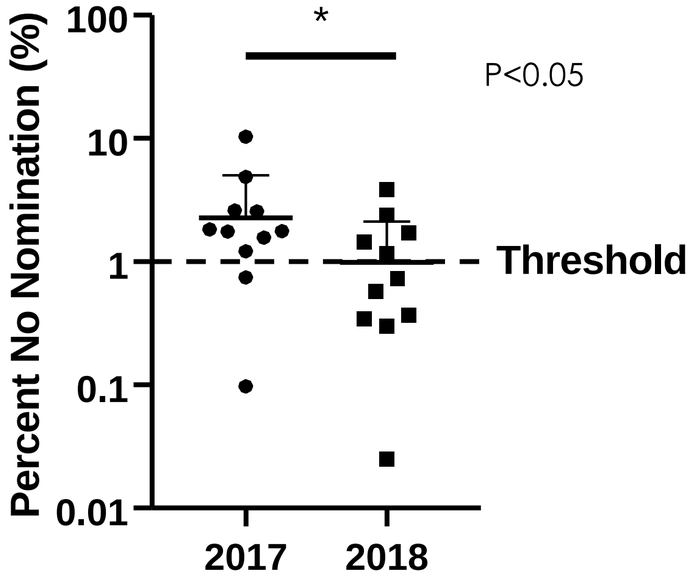
Impact of QC on Nominators' performance

2017



2018





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SUMMARY

- The CDCB has developed a customized QC system for evaluating laboratories performance
- Previous experience with the nominators demonstrated the positive impact after implementing a similar approach
- The QC program will assist the laboratories in delivering high quality data and contribute to maintaining the integrity of the CDCB database

ACKNOWLEDGEMENTS

- Participating dairy producers for supplying data
- DHI organizations and DRPCs for processing and relaying the information to the **Council on Dairy Cattle Breeding (CDCB)**
- Purebred breed associations for providing pedigree data

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Thanks for your attention

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