**Promotion Optimization – Mid Year Accomplishments (& status) - 2020**

**Note: Priorities are in black bullets and Accomplishments (& status) are in maroon text under the corresponding priorities.**

**INNOVATION Priorities:**

* Inform the planning, execution and evaluation of DET campaigns
  + Campaign forecasting design tool - Build simulation framework for DET campaigns to determine probability of various success parameters (ROI, sales volume) while planning for campaigns.

A prototype for G9 Adolescents campaign has been designed and is in the process of completion (by mid-September)

A larger tool type of development is planned with Datazymes. Yet to start this process.

* **P**roactively provide new insights & recommendations to drive **incremental revenue**, with a particular focus on DETs, Vaccines & Oncology, and New Products
  + Coupon / Evoucher design evaluations & IPF optimization: Reduce implementation time and produce consistent results through tools development

Coupon / EVoucher design evaluation tool has been developed and the second phase extension to do state level design evaluations is near complete. Developed by Datazymes.

IPF Optimization tool development is put on hold due to resource constraints and likely will be in next year

* + Research and develop a framework to study sales impact of promotions at tumor level for Keytruda.

Several models to investigate personal and non-personal promotion impacts using Keytruda claims data were studied for Lung, Melonoma+H&N tumors. Top level patterns suggest that claims data at HCP level may be ok for Personal promotions but for HCP non-personal promotions a higher level aggregations may have to be considered as HCP level model seems to not pick up non-personal impact signal due to likely higher signal to noise ratio at HCP level (i.e., missing claims coverage). A zip3 level aggregation seems to reduce this issues and non-personal impacts could be captured. This may have aggregation bias but seems to be the best available estimate at this point.

Further research is needed here, and we are collaborating with Nicolas’s team to share and learn the findings.

* + Develop portfolio budget allocation framework for Keytruda

Successfully completed the development of DOMINO tool to provide budget allocations for Keytruda. First round of 2021 tumor and high-level budgets (approx. $450MM to $550MM) were largely guided by DOMINO process.

* + Expand data and methods to evaluate DET campaigns

Completed Gardasil Adolescents Wave 2 and Dificid Wave 1 campaign measurements.

* Improve “**Data & Analytics Operating Model**”
  + Develop HCP & HCC Grail like analytical data sets to improve execution time for Mkt. Mix models.

HCP non-personal grail like dataset for Market Mix models have been developed.

HCC part is under discussions but has not started.

* + Support evolution of HCC Health Map capability development

Minimal requests are made at this point. Regular interactions between Will’s group and our group has been happening and corresponding inputs are provided.

We see a great potential in expanding our consumer advanced analytics projects once the database is setup.

**CORE SERVICES Priorities:**

* Focus on evolving analytics services for DETs, Vaccine, Oncology, CC/WH and Hospital/Specialty business units.
  + Expand Mkt. Mix and HCP/HCC promotion impact & ROI work streams:
    1. Keytruda(2X), Gardasil (2X), Nexplanon, Belsomra, Januvia, Steglatro, P23, Lynparza (new), Lenvima (new), Bridion, Zerbaxa

Completed Mkt. Mix for Keytruda, Gardasil, Nexplanon, Belsomra, Januvia, Steglatro and P23

Lynparza consumer tactics Mkt. Mix is under progress. Bridion as completed at the beginning of the year.

New Pediatric vaccine analysis is being considered. Yet to decide whether to go with Quantzig (pricing issues)

New COVID related impact analysis is under plan with ZS. Phase 1 just started.

* + Expand DET campaign evaluations: Gardasil, Dificid, Steglatro

G9 Wave 2 and Dificid Wave 1 completed.

Steglatro DET project cancelled due to compliance related reasons.

* + Optimal promotional budget allocations through IPF:
    - * Gardasil, Nexplanon, Belsomra, Januvia, Steglatro , P23

Work currently in progress.

* + Coupon/Evoucher design and performance evaluations:
    1. Januvia, Steglatro, Belsomra, Verciguat, HIV

Few Januvia Coupon related questions were answered.

Verciguat analysis is underway. Collaborating with IQVIA as well as working independently.

* + Support Crossix HCC media analysis, New cost saving HCC media targeting proposals, and HCC brand strategy:
    1. Keytruda, Gardasil, Nexplanon, Belsomra, Januvia, Steglatro, P23, Lynparza

Crossix HCC net conversion ROI analysis completed for all listed products. For few of the products, results are being currently shared with brand and media teams.

Initial support in terms of methods review has been provided for new HCC cost savings proposal by Initiative.

HCC brand strategy consultation has been an ongoing process – particularly for Keytruda, Gardasil and Nexplanon – brands with highest spends in this area. Most time is spent for Keytruda in this area.

* + Others:
    1. Keytruda CIA models, Adhoc HCP/HCC Pilots, PRCs, HCC In-office evaluations, Adherence programs, Scoring models

Work underway for Keytruda CIA models.

PRCs and HCC In-Office evaluations are completed on a regular basis for multiple brands

Yet to start Scoring models

New compliance issues have recommended a minimal involvement in measuring Adherence programs (NRx change is ok bit nothing more). This is posing some issues for IPF process and we are adapting accordingly.

* Continue to provide analytical insights and guidance to support the successful deployment & scaling of the NBE capability.
  + Diabetes, Gardasil, Keytruda, P23

Regular NBE support is being provided where needed for all above mentioned products.

Being part of sales pitch for 2021 NBE expansions by answering brand concerns and adapting the NBEs accordingly. We have got a lot of requests in this area (all simple but adds up).

* Identify and implement a new sourcing model for MMM work to increase frequency of updates and free-up analytic capacity.
  + Evaluate staffing model & tools to accommodate two sets of marketing mix models for major brands such as Keytruda, Gardasil

Keytruda is addressed through ZS.

Reevaluation of ZS tool was done and some more modifications suggested. Global eams are also trying to build tools here.

One of our summer intern (Alex) ***researched interpretable ML tool as an alternative model here and has shown a good future promise.*** Has developed a R tool to automate a large portion of this research so that ters in the group could start to use the research tool.

**COE DEVELOPMENT Priorities:**

* Reshuffle some of the staff responsibilities so as to encourage learnings and distribute the knowledge base. Ex: HCC & NBE responsibilities distributed among team members.

HCC and HCP responsibilities were reshuffled extensively particularly after Yan left the team.

Ambika, Tracie and Arun have adapted to the new HCC responsibilities very well and even under tight resource constraints, we are able to support the brand teams appropriately. Keytruda, G9 and Nexplanon have noted this and have shared their appreciations.

* Expand team based agile development (using Jira) for Mkt. Mix and IPF (new).

Switched to Microsoft Teams for agile development as a team for Mkt. Mix and IPF.

* Pull-through on MAIO virtual BU team for CC/WH

Have bi-weekly meetings and have been primarily focusing on cross learnings across different teams within MAIO. Benefits at this point include results sharing, data questions being answered and overall awareness of different MAIO team’s work.

* Externally Source Highly Skilled Quantitative Scientists to Expand Analytic Capacity-Datazymes, ZS

Datazymes resources are more productive now and extensively supported Mkt. Mix processes, DET analysis and Grail-data development.

We continue to work with ZS for Keytruda and new COVID related impact analysis projects.

* Continue the MAIO Analytics Internship Program (2 interns) to identify and evaluate early analytic talent.
  + Study Netflix approaches and implement relevant ones for NBE recommendations

Michael Johnson – one of our summer intern – studied the deep learning convolutional NN and hybrid back propogation networks to mimic the NBE process for Januvia and Steglatro. The intern has created a strong R code base to continue the research. This is a complex project with highly challenging implementations and some clear learnings have come out of Michael’s work. Provides a future framework and code base to expand the studies.

* + Study PRCs through evaluation of predictive models (NN, Random Forest etc)

Alex daSilva – another summer intern – has gone well beyond the objectives stated here and have studied interpretable ML as a means to obtain non-linear partial dependence plots that are equivalent of promotional response curves for various channels. Methods include, linear models, restricted and un-restricted GAMs, xgboost (traditional as well a monotonically increasing constrained ones). Alex has also created an automation tool in R for others in the team to explore their data. Interpretations were enhanced using Shapley regressions as a separate track of studies. Overall, this has been an extremely productive work and the outputs were way well beyond expectations.

* Provide department-wide R, Python & Best Practices training and project opportunities.

A lot of cross-functional project opportunities being provided to all team members.

No meaningful progress in terms of R and Python training yet.

**COMPLIANCE Priorities:**

* Ensure all members of my organization carry a meaningful compliance priority, complete all required compliance training on time, and conduct themselves in a manner consistent with the letter and spirit of our policies
* Constructively engage compliance and legal to gain input on business strategies, plans and initiatives.