FRESH prespective

Conference Presentation
Oncology Forecasting

Part 2: Sourcing, Adapting and Integrating Data

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Oncology Forecasting

Part 2: Sourcing, Adapting and Integrating Data

Hosted by:

PMSA
PHARMACEUTICAL MANAGEMENT SCIENCE ASSOCIATION

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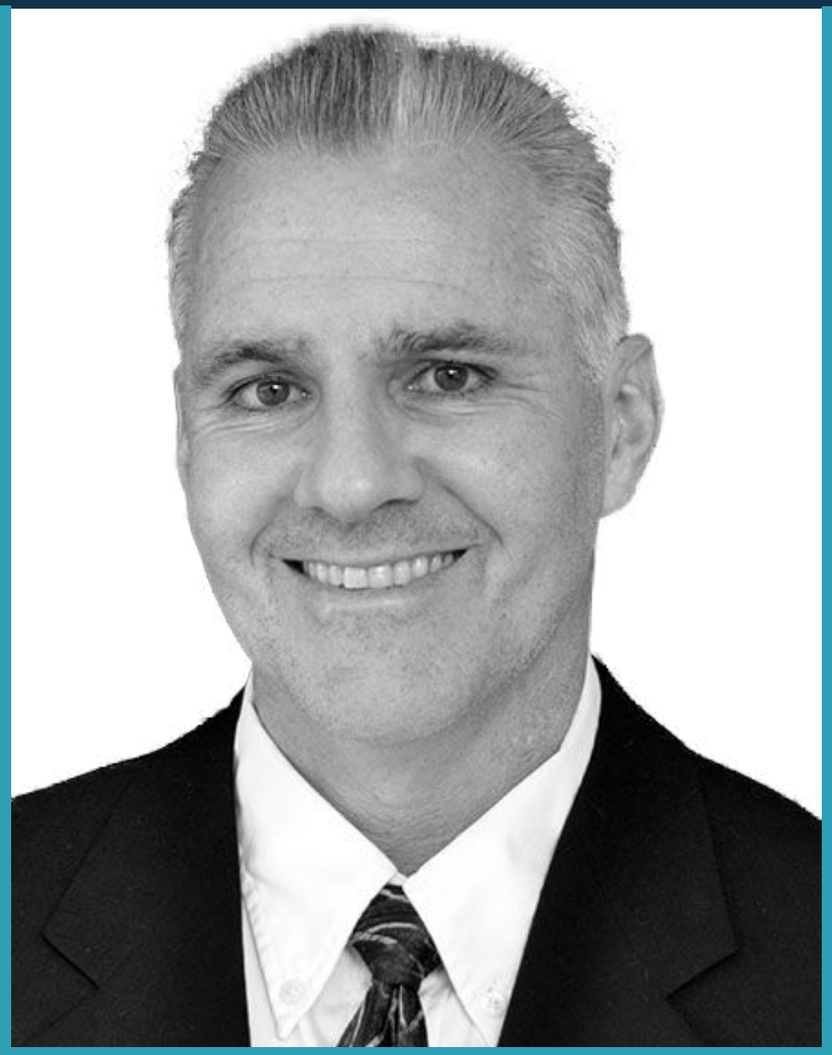
Today's Presenters



Bernie Manente
Associate Partner

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Webinar Overview

- Oncology Data Requirements
- Sourcing and Integrating Data
- Adaptive Patient Flow Model

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Oncology Data Requirements

Structured Oncology Forecasting Development Process

1. Develop the Baseline Market
2. Address required Input and Output Complexity
3. Identify Events (if required)
4. Acquire or Construct the Forecast Model
5. Developing “Reasonable” Business/Forecast Scenarios

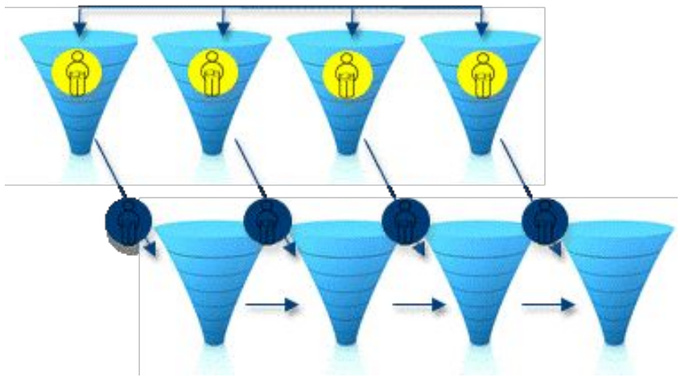
Demand Models

TRx, Units, Patients

Epi-Based Models

Static Patient Flow

Adaptive Patient Flow



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Question

In you opinion, what is the most challenging data to secure for oncology forecasting?

1) *Disease incidence data*
2) *Disease prevalence data*
3) *Biomarker incidence data*
4) *Diagnosis and treatment data*
5) *Data related to cure and progression*

Type your response into the survey tool

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Oncology Data Requirements

Epi-Based Forecast Data Requirements

1. Demographic data
2. Disease incidence rates (newly diagnosed)
3. Disease prevalence rates (directly sourced or calculated)
4. Biomarker incidence and testing rates
5. Diagnosis rates
6. Treatment rates
7. Cure rates
8. Progression Curves
9. Progression Pathways

GOAL:
Baseline market of treatable patients

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Oncology Data Requirements

Reaching the Baseline Market

GOAL:
Baseline market of treatable patients

Demographics: Population

Incidence: Newly Dx'd Population with Disease

Past/Present/Future Perspectives Feed into Algorithm

Stage Distribution

Treatment Distribution

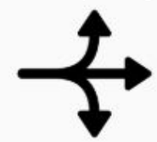
Aligned to:

Biomarker Subsets

Drug and non-drug treatments

Evolved by:

Cure and progression



Pathways, sequencing and timelines

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Sourcing and Integrating Data

Demographic Data: Rationale and Sources

- Data required to project the population demography for any country
- Projected data acts as a basis for an epi projection
- Issues occur when :
  - Data lags current year
  - There is inconsistency in age/gender groupings
  - Growth data is not consistent

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Sourcing and Integrating Data

Demographic Data: Rationale and Sources

Demographic data elements	US	UK	France	Italy	Germany	Spain	Japan	China
Total population, age gender splits, growth rates for each split	US Census Bureau	Office for National Statistics	The National Institute of Statistics and Economic Studies	Italian National Institute of Statistics	The Federal Statistical Office	Spanish Statistical Office	Statistics Bureau of Japan	National Bureau of Statistics of China

Country specific sources are easily found

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Sourcing and Integrating Data

Incidence Data: Rationale and Sources

- Data required to project the new cases of disease
- Incidence data can be applied against demographic data
- Multiple ways that data can be provided
  - Aggregate, by specific age and/or gender
  - Crude rates, age-adjusted
- Issues occur when:
  - Data lags current year
  - There is inconsistency in age/gender groupings
  - Growth data is not consistent
  - Not sure which dataset to use

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Sourcing and Integrating Data

Incidence Data: Rationale and Sources

Incidence data element	US	UK	France	Italy	Germany	Spain	Japan	China
Incidence Age/gender subsets & growth rates	SEER (Surveillance, Epidemiology and End-Results Program) Incidence Database	Cancer Research UK (2013-2015); Cancer Incidence in Five Continents (CI5) (2012)	Cancer Incidence in Five Continents (CI5) (Up to 2012)	Cancer Incidence in Five Continents (CI5) (Up to 2012)	Association of Population-based Cancer Registries / Robert Koch Institute (GEKID/RKI) (2014)	Cancer Incidence in Five Continents (CI5) (Up to 2012)	National Cancer Center (NCC) (Up to 2013)	Cancer Incidence in Five Continents (CI5) (Up to 2012)

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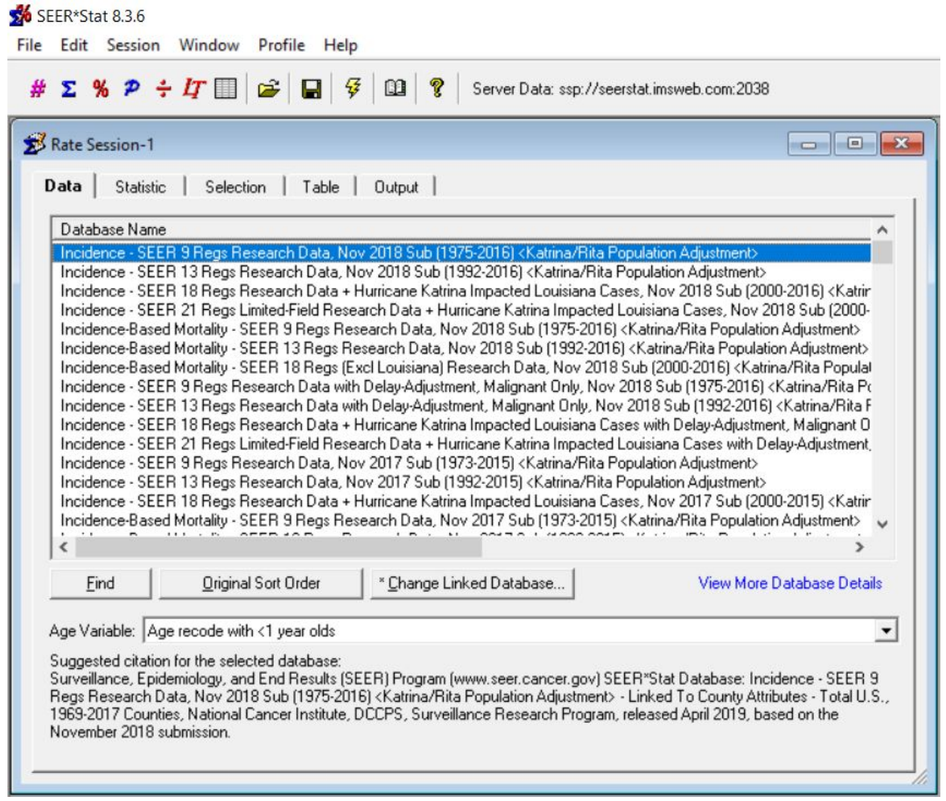
Sourcing and Integrating Data

Incidence Data: SEER

- Online: SEER*Explorer
- Database: SEER*Stat
- SEER provides data on incidence, limited-duration prevalence, and survival
- Databases: SEER Registry 9,13,18,and 21, and USCS (NPCR & SEER)
  - Differences in timing and population samples
- USCS database has the largest sample size (300M)



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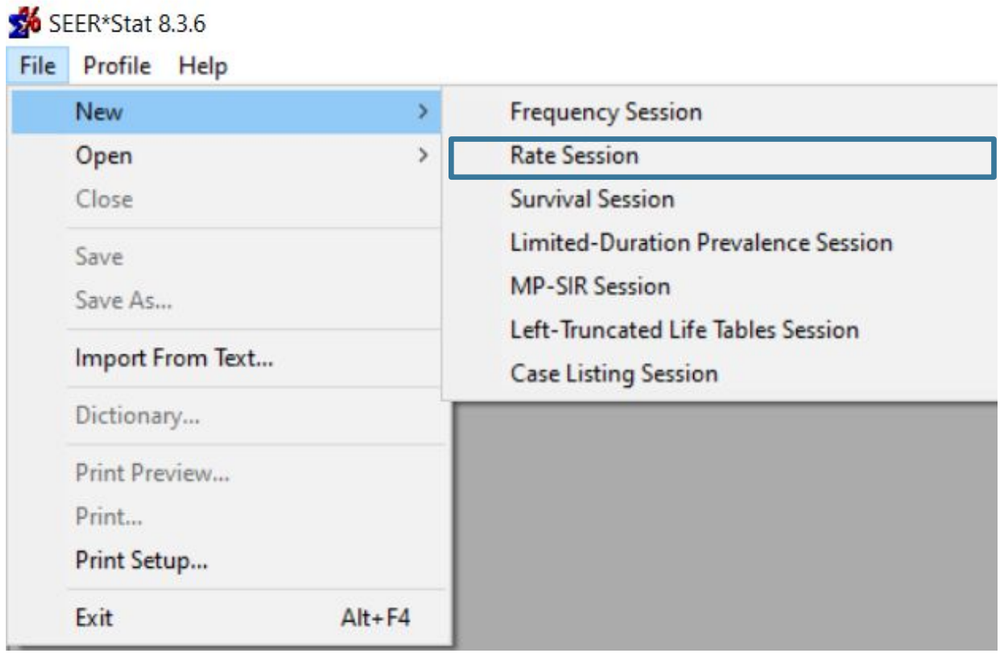
Sourcing and Integrating Data

Incidence Data: SEER

- SEER*Stat is a desktop application that allows users to run customized analysis using the SEER database
- The Rate Session is the required data extract for an epi-based forecast
- Rates are reported per 100,000 people and crude and age-adjusted rates are available



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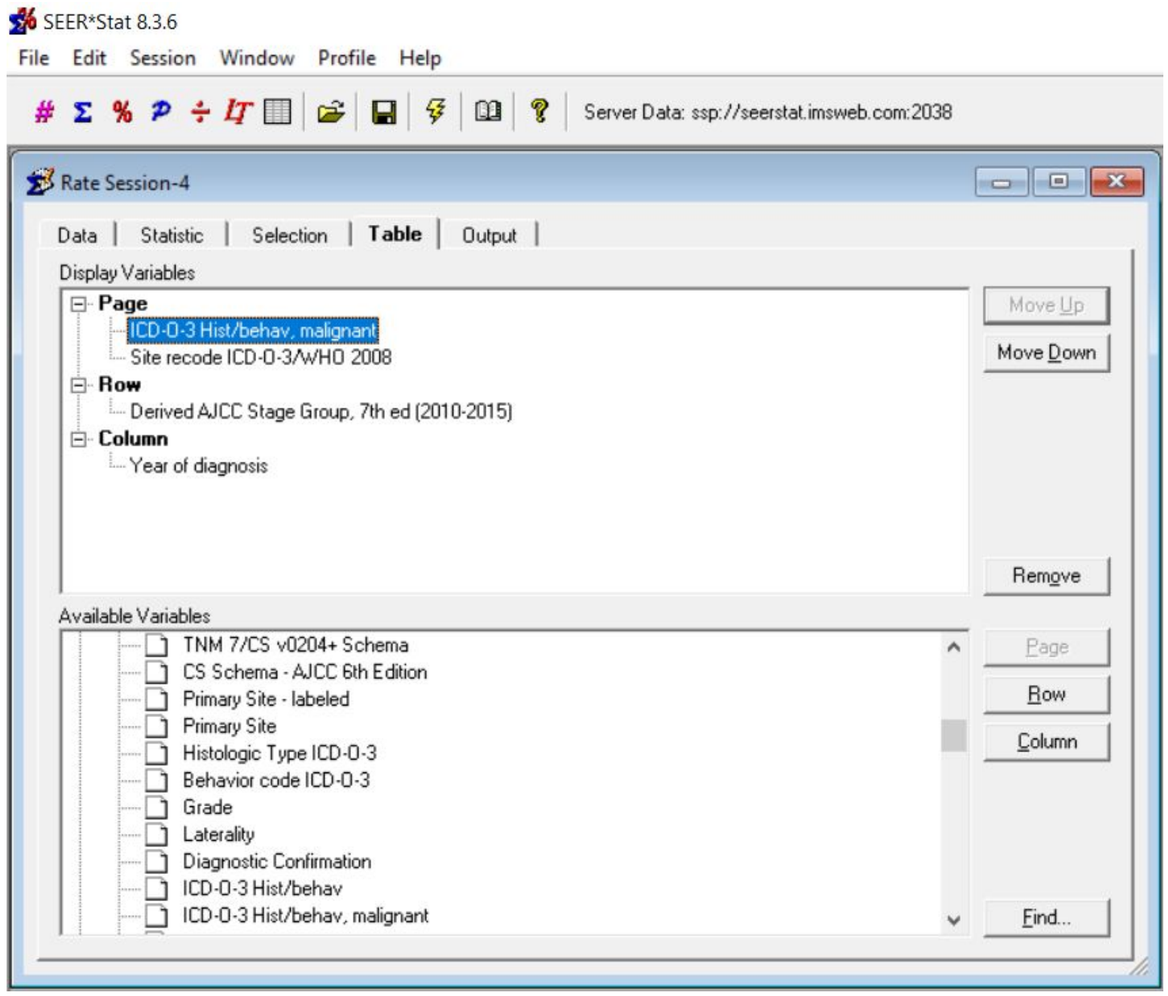
Sourcing and Integrating Data

Incidence Data: SEER

- Defining the target oncology patients is the most critical step
- Patients can be segmented by standard group (e.g., sites), histology & behavior (i.e., ICD-O-3 codes)
- Data needs to be pulled by year, so it can be trended for future years



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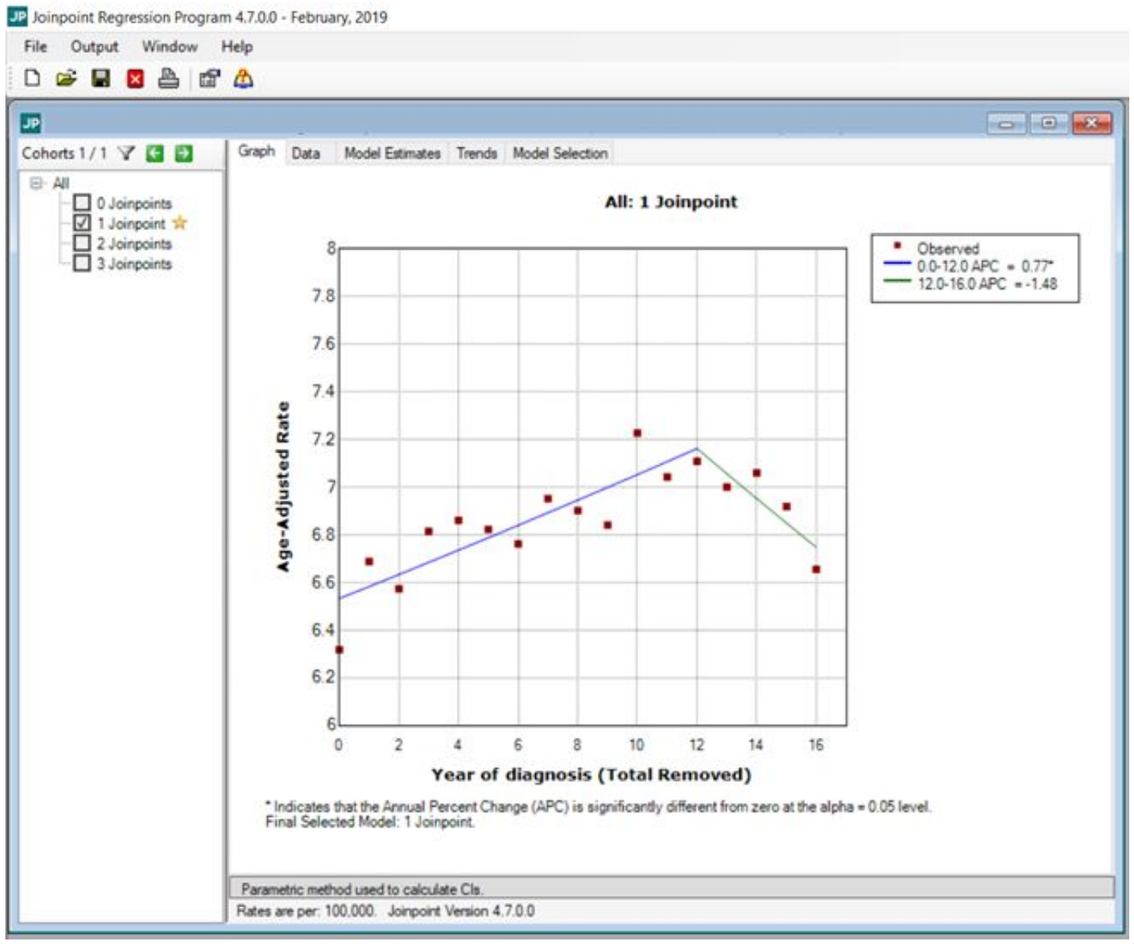
Sourcing and Integrating Data

Incidence Data: SEER

- SEER provides historical data up to year 2016; therefore, it is necessary to forecast the data
- SEER uses Joinpoint to forecast oncology trends; however, other statistical software (e.g., ForecastPro) is also valid



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Incidence Data: Other Sources

- German cancer registry data/CI-5 Cancer data/ National Cancer Center Japan/Cancer Research UK
- All similar mechanisms to SEER to find country specific incidence data
- Suffer from some of the issues outlined earlier

ZENTRUM FÜR KREBSREGISTERDATEN

ZfKD | Cancer sites | Database Query

CANCER RESEARCH UK

International Agency for Research on Cancer

World Health Organization

CI5*plus*

Cancer Incidence in Five Continents Time Trends

国立研究開発法人
国立がん研究センター
National Cancer Center Japan

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Question

How do you get Teams aligned when there are different perspectives on market size?

1) *Work through it by consensus*
2) *Agree in the meeting and change it later*
3) *Align to the view of the most senior person*
4) *Take it offline*
5) *Go back, do more research and discuss again (and again and again)*

Type your response into the survey tool

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Sourcing and Integrating Data

Incidence Data: Reconciling Differences

- New cases of disease are an essential precursor input to determine prevalence of treatable patients in an adaptive flow model so alignment is critical
- Often have published datasets for new cases that do not reconcile to detailed calculations
- Also have aggregate rates that do not equate to detailed calculations
- Our approach as mentioned in last session: “Strive for reasonableness”
- Analysis paralysis can occur looking for the perfect answer

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Sourcing and Integrating Data

Biomarker Incidence and Testing Rates

- Treatment subsets are increasingly driven by biomarkers
- Literature research and primary market research can inform biomarker incidence assumptions
- Testing and diagnosis rates are influenced by:
  - The uniqueness of the biomarker
  - The availability of a test
  - The reliability of a test
  - The need for systemic change (EGFR: tissue)
- Trials provide a glimpse into emergent biomarkers

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Sourcing and Integrating Data

Treatment Clusters and Rates

- Diagnosis rates are less essential (outside of biomarkers) since cancer patients will ultimately be diagnosed
- Treatment clusters must be identified and patient flows into each cluster must be estimated
- Literature research and primary market research can inform cure rate assumptions

- Treatment clusters can be represented by disease biology (biomarkers), age, intervention type (surgery, drugs radiation) and/or drug regimens
- When creating clusters, must be able to secure data in downstream components

Sourcing and Integrating Data

Cure Rate

Considerations

- Determining a cure rate for each treatment/stage cluster is essential to avoid overstating the pool of treatable patients
- Cure is rarely an outcome in metastatic cancer
- However, cure needs to be factored in for early-stage cancers and tumors with high cure rates such as Hodgkin's lymphoma or thyroid cancer

Process

- Literature research and primary market research can inform cure rate assumptions
- For established tumors and treatments, long-term PFS curves can provide a proxy for cure rates
- For new therapies, the lack of long-term data can be overcome by validating assumptions with KOLs and internal medical experts

Cure rates are an essential component of the Adaptive Patient Flow Model – they help better estimate the size of your targetable pool of patients

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Progression Pathways

Considerations

- Algorithms must detail the pathway along which patients will move during their journey
- Complex patients movements that may need to be modeled include:
  - Local and distant recurrence
  - Specific sequencing
  - Stratification of downstream stage by age, performance status, disease free interval

Process

- Literature research is leveraged to identify the patient progression pathways
- Primary research is invaluable in complex pathways
- Consideration must also be given to past and future movements

Patient cohorts move along the treatment algorithm according to the model's progression pathway built in-house and validated by primary or secondary research

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Sourcing and Integrating Data

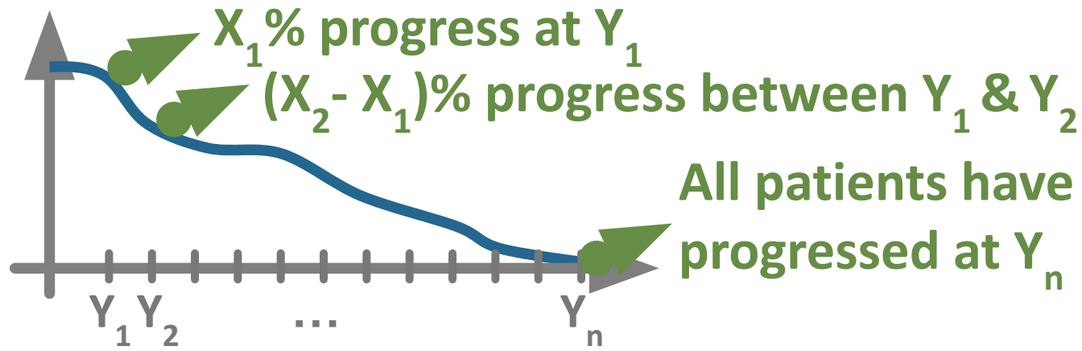
Progression Curves

Considerations

- Progression curves are a crucial aspect of patient flow models, as they inform when patients progress to the next treatment cluster
- Real world datasets are preferred to best reflect actual patient flows
- Clinical data can be used as a proxy for new therapies

Process

- Literature research is leveraged to identify appropriate KM curves



- A curve is derived to inform the model when to reintroduce progressers into the treatable pool

Patient cohorts move along the treatment algorithm over time according to the model's progression curve in conjunction with the progression pathway

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Question

When we do primary research with key opinion leaders to get their perspectives on treatment:

1) *We get too much detail*
2) *We do not get enough detail*
3) *Their opinions are too dissimilar*
4) *I can't translate their opinions to a market view*
5) *None of the above*

Type your response into the survey tool

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Sourcing and Integrating Data

Structuring Algorithms

- Algorithms must comprise all of the preceding data points in a way that accurately represents the decision points and patient movement in a clinical context
- We have effectively developed algorithms in Excel, Access, Python and Visual Basic
- Algorithms must work in concert with new patient inflow to project and summarize past, current and future market dynamics
- Target subsets within the algorithm represent baseline market segments

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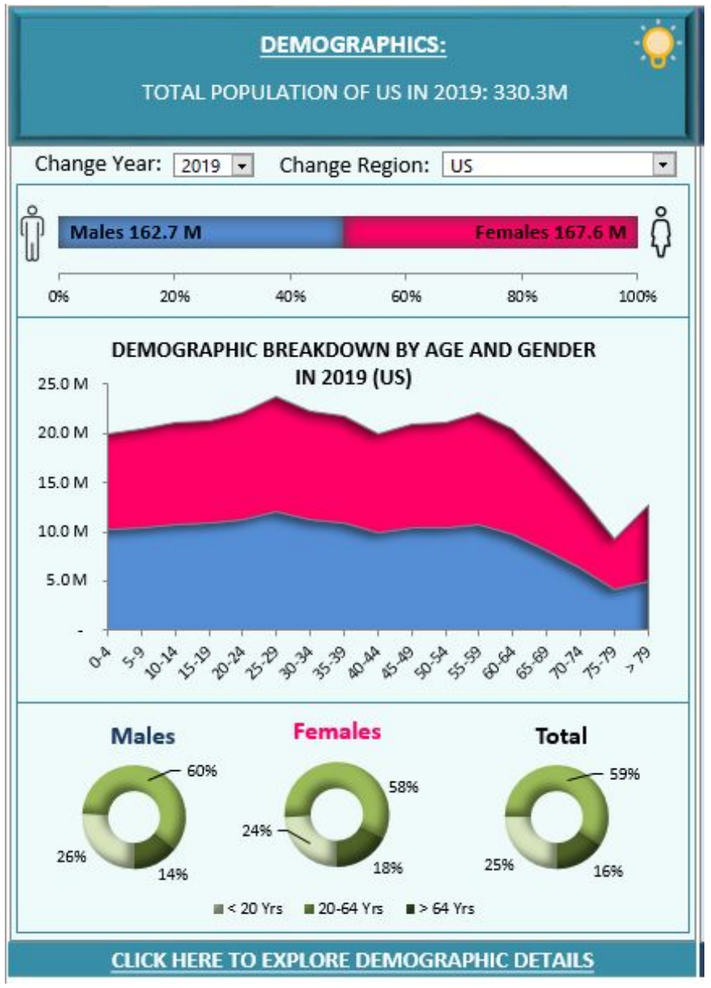
Adaptive Patient Flow Model

OncoEdge Example: Demographics

- Demographic data operates as the basis for determining new cases
- Example of demographic projections created from country specific data
- 5-year age gender splits with dynamic rate of growth assumptions



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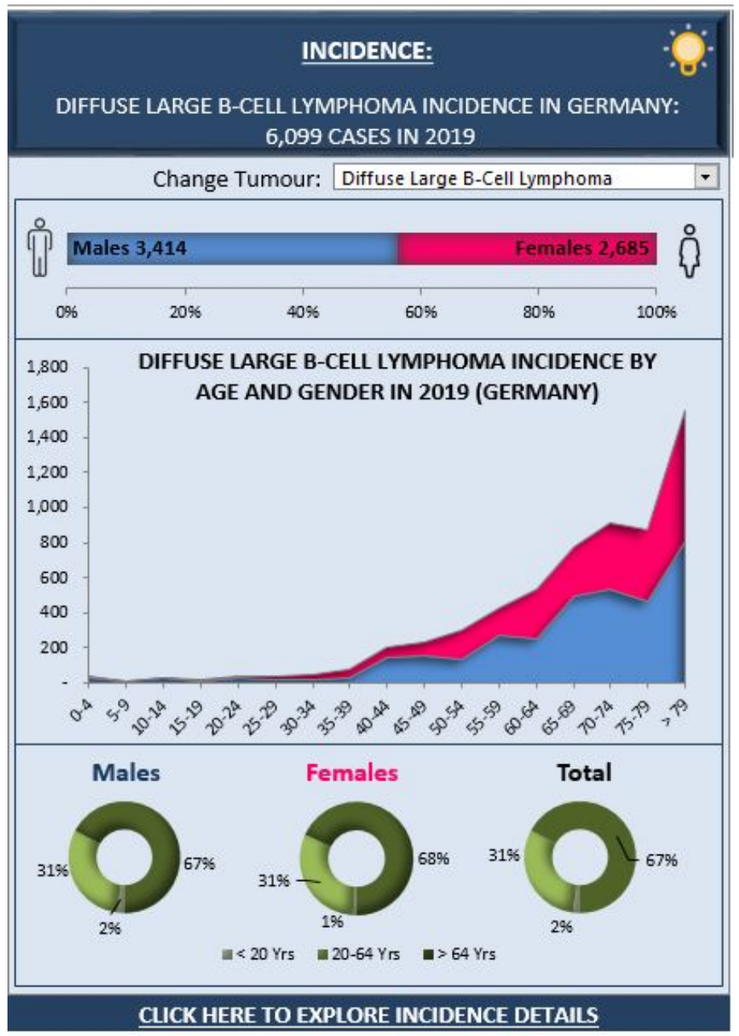
Adaptive Patient Flow Model

OncoEdge Example: Incidence

- Incidence data operates as the basis for determining current and future prevalence
- Example of incidence projections created from country specific data
- 5-year age gender splits with dynamic rate of growth assumptions



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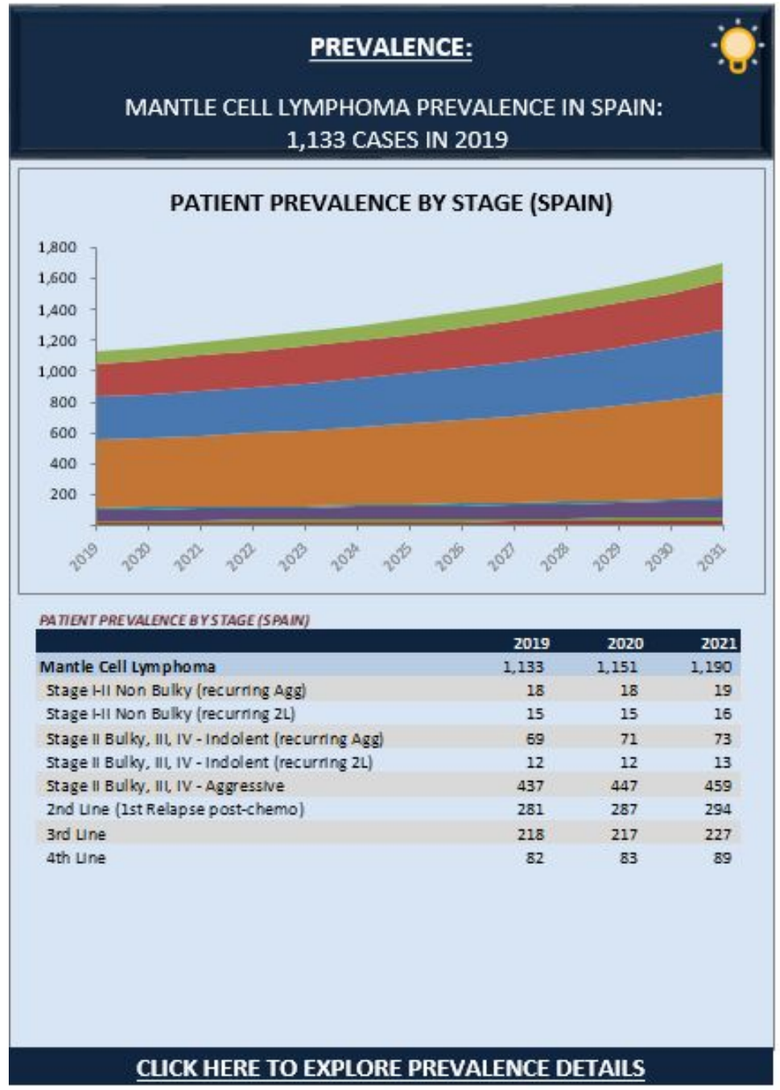
Adaptive Patient Flow Model

OncoEdge Example: Prevalence

- Prevalence data represents current and future patients in active treatment in any given year
- Example of prevalence projections created from demographic data, incidence data and treatment algorithm using Adaptive Patient Flow methodology



	2019	2020	2021
Mantle Cell Lymphoma	1,133	1,151	1,190
Stage I-II Non Bulky (recurring Agg)	18	18	19
Stage I-II Non Bulky (recurring 2L)	15	15	16
Stage II Bulky, III, IV - Indolent (recurring Agg)	69	71	73
Stage II Bulky, III, IV - Indolent (recurring 2L)	12	12	13
Stage II Bulky, III, IV - Aggressive	437	447	459
2nd Line (1st Relapse post-chemo)	281	287	294
3rd Line	218	217	227
4th Line	82	83	89

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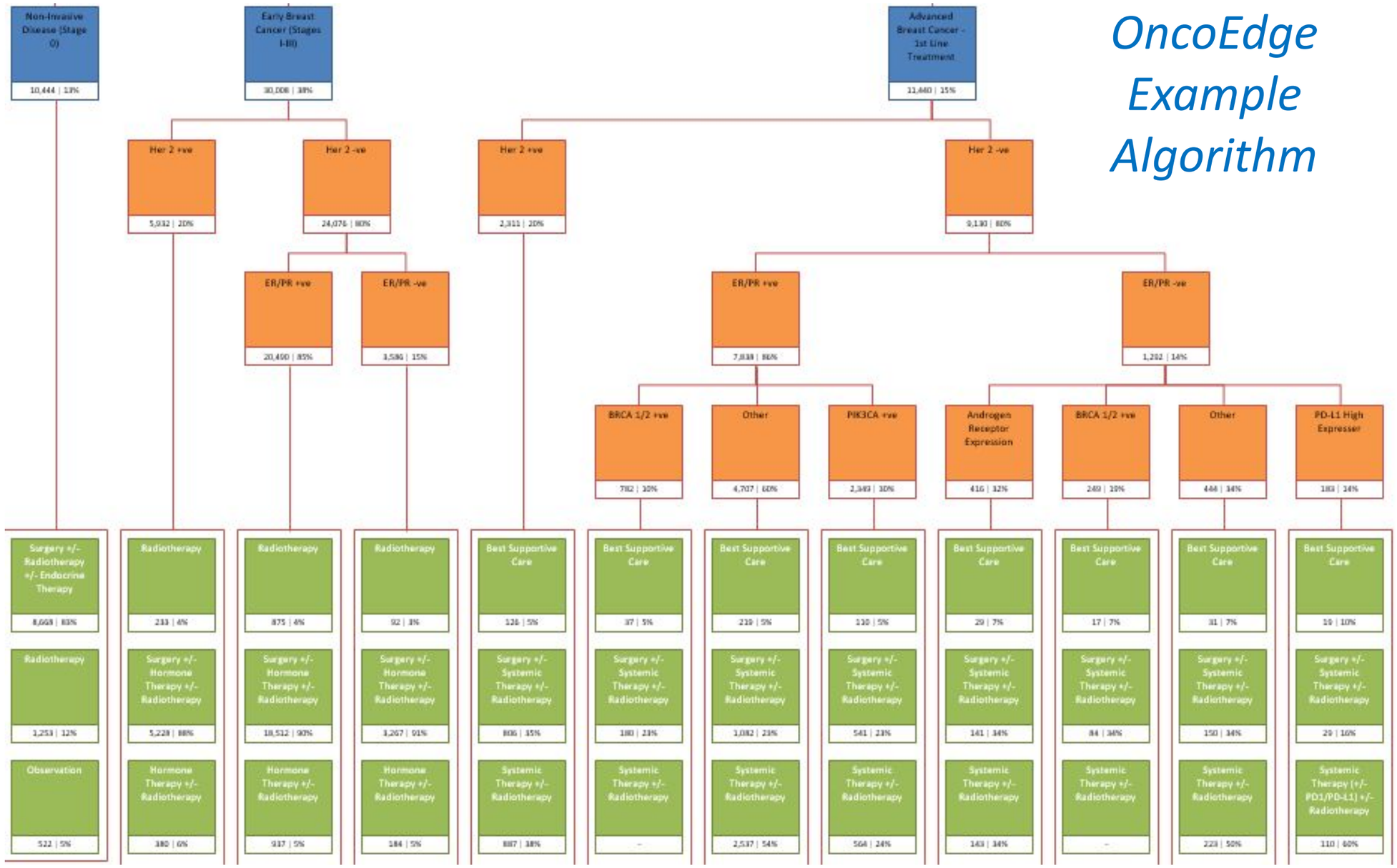
Adaptive Patient Flow Model

Stage distribution

Biomarker subsets (current and emerging)

Treatment clusters (current and emerging)

Not shown: cure rates, progression curves and pathways



OncoEdge Example Algorithm

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Questions

Please feel free to ask questions

Type your response into the survey tool

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Model Development

Addressing Outputs

- Complex output = Greater development effort
  - Multiple forecast outputs (Patients, Gross and Net Dollars, MGs, Share)
  - Multiple countries & currencies
  - Require additional analytics
    - ✔ Waterfall analysis
    - ✔ Tornado plots
    - ✔ Sensitivity / What if analysis

Recommend

- Graphical interface
- Data export
- Transparency

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Model Development

Acquire or Build?

Dependent on

- Budgets
- Timelines
- Capacity for uncertainty
- Need for accuracy
- Complexity

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Question

What kinds of processes exist in your companies to validate / align on forecast assumptions?

1) *We don't align*
2) *Periodic meetings through the forecast development*
3) *Formal touchpoints in the process*

Type your response into the survey tool

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Securing Alignment

Developing Reasonable Business Forecasts

- Internal alignment is a key component of “Blessing” the forecast
- Alignment may be based on formal or informal processes
- Must be done at each step in the structured development process (step 1-5)

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Securing Alignment

Developing Reasonable Business Forecasts

- Alignment with respect to Oncology forecasts can be additionally challenging
- Driven by:
  - Management expectations of patient population
    - ✔ Historical numbers that do not align
    - ✔ Ad Board/KOL opinions
  - Internal processes
    - ✔ Target numbers set pre-launch
  - Proxies from other markets (which do not always transfer)
  - Preconceived notions of peak sales $

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Securing Alignment

Developing Reasonable Business Forecasts

- Alignment is best facilitated by
  - Transparency
  - Validation
  - Involvement in the process
  - Periodic touchpoints
  - Striving for “reasonableness”