

# Trastuzumab deruxtecan for treating HER2-positive unresectable or metastatic breast cancer after trastuzumab and a taxane

Slides for public –  
fully redacted

Technology appraisal committee A [11<sup>th</sup> October 2022]

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Evidence assessment group: Newcastle NIHR

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Company: Daiichi Sankyo

# Key issues

Table 1 Key uncertainties and issues for discussion

| Issue  | ICER impact   |
|--|---|
| Severity – should a severity weighting be applied  | Large  |
| Uncertain OS predictions for T-D arm after 2 years | Large  |
| Post-progression utility values                    | Small  |
| Vial wastage                                       | Small  |
| Generalisability of trial                          | Unknown   |

Abbreviations: AEs, adverse events; ICER, incremental cost-effectiveness ratio; OS, overall survival; PFS, progression free survival; T-D, trastuzumab deruxtecan

# Context of Cancer Drugs Fund

## Estimates of cost effectiveness

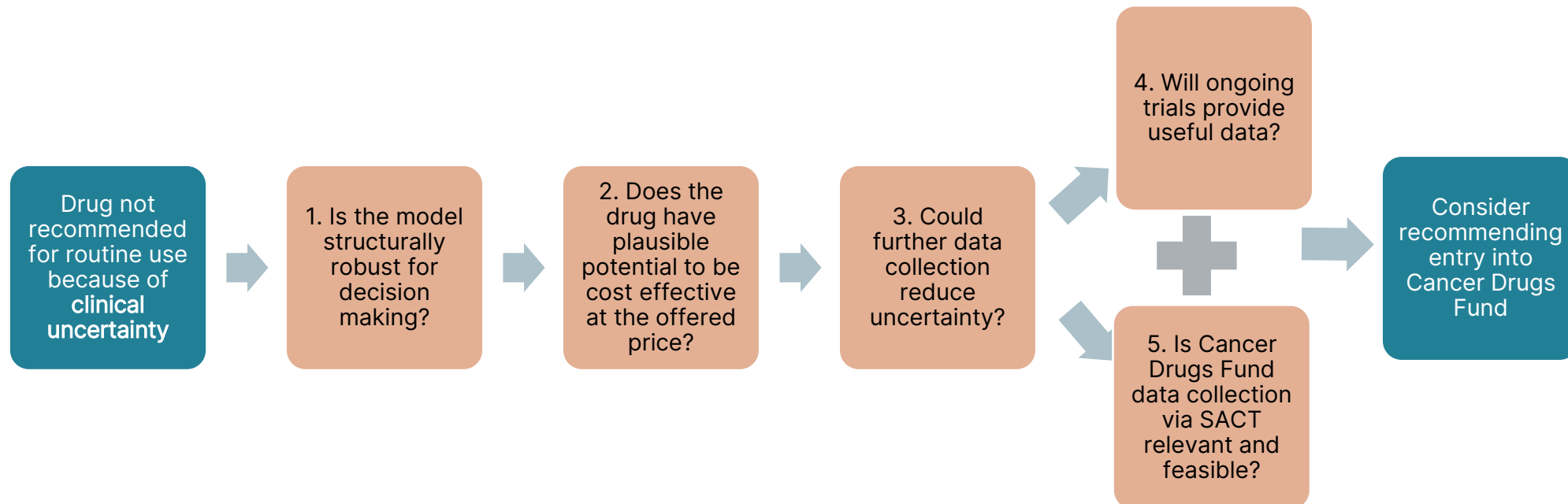
Company base case  
> £30k/QALY  
EAG base case  
> £30/QALY

## Company proposal for managed access

- Would like to be considered for routine use
- Company acknowledge evidential uncertainties
- Submitted a proposal for further data collection

## NICE managed access feasibility assessment

- Consider it suitable for CDF
- Further data can be collected in managed access
  - Further effectiveness data in the trial
  - RWE from SACT to address generalisability



# HER2-positive unresectable or metastatic breast cancer

## Epidemiology

- 48,387 new BC cases in England in 2019, unresectable and metastatic are advanced forms of BC
- HER2 overexpression in 13 - 20% of BC tumours- aggressive disease that responds poorly to conventional chemotherapy and is treated with targeted treatments
- Company estimate 346 people would start treatment with T-D each year in England

## Symptoms

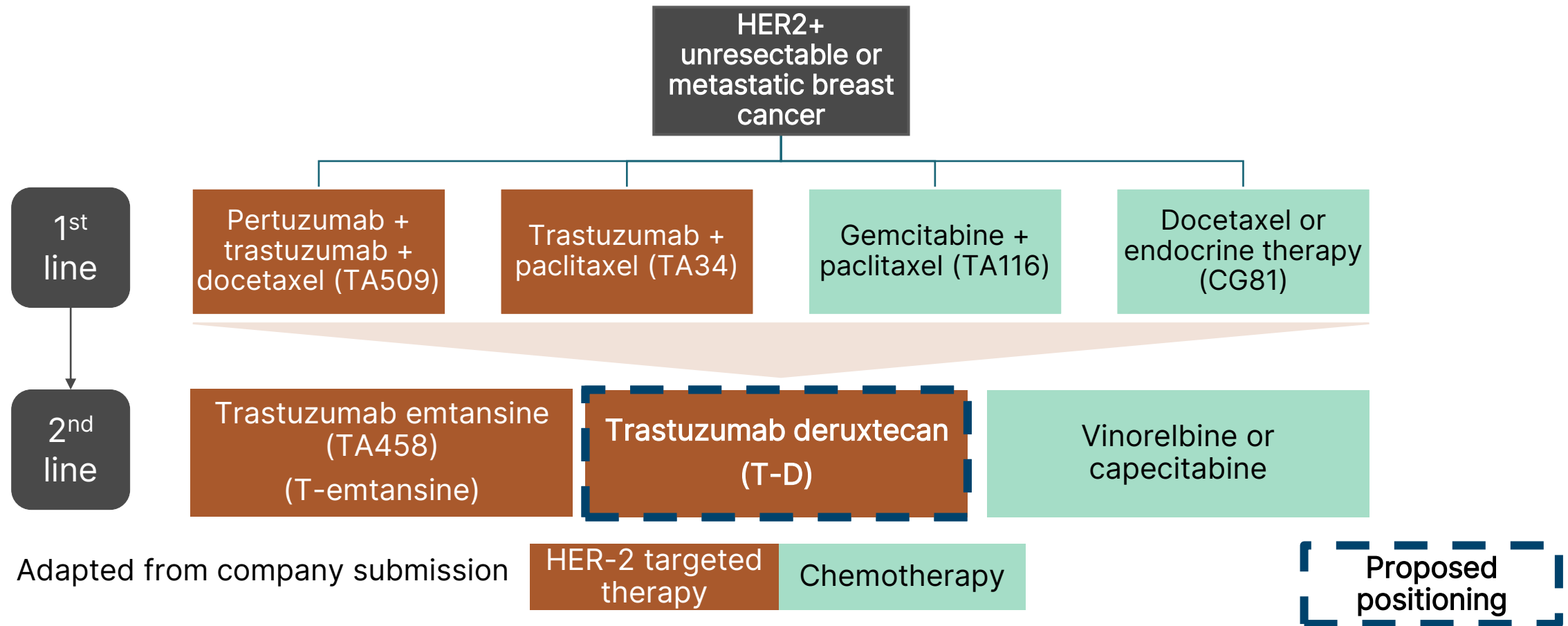
- Metastatic disease has additional symptom burden including lethargy, reduced appetite, and weight loss, alongside symptoms specific to location of metastases

## Prognosis

- No curative therapy for unresectable/metastatic BC. Stage IV 1- and 5-year survival of 66% and 27% respectively
  - No data identified specific to the subset of people with Stage III unresectable disease

# Treatment pathway: HER2-positive unresectable or metastatic breast cancer

Figure 1 Treatment pathway in HER2-positive unresectable or metastatic breast cancer



Is this pathway consistent with UK clinical practice?

# Patient and carer perspectives

## Submissions from: Breast Cancer Now, MET UP UK

- HER2-positive mBC is incurable and life-limiting disease → unmet need for therapies that control disease progression, extend life and have acceptable tolerability
- Value extra time progression-free
- Maintaining good quality of life for as long as possible is currently the best outcome
- Disadvantage of T-D is side effects. Experiences with side effects will vary, as will people's willingness to risk the side effects associated with treatment
- Do not want to lose T-emtansine, because there are limited lines of anti-HER2 therapies available on NHS → Not everyone will respond to T-D, and will value having T-emtansine as an option

“Keen to find treatments that will halt progression and extend life for as long as possible”

“Side effects have been manageable and in comparison to before [T-D]. I will take these side effects as what I have gained in quality of life is exceptional and I really didn't think after so long I would feel this well again”

“Important that any drug I take doesn't have horrific side effects... Drugs coming down the line for secondary breast cancer need to ensure quality of life. By the time of a secondary breast cancer diagnosis, we've been through so much”

# Clinical perspectives

## Submissions from: NCRI-ACP-RCP-RCR

- Metastatic HER2-positive breast cancer is incurable and progressive with poor prognosis and limited effective treatment options
- T-D is a HER2-targeted treatment that fills an unmet need in the 2nd line treatment. It is believed to be a therapeutic advancement due to its improved PFS rates and duration of response compared with current standard of care, T-emtansine
- D-B03 data show that T-D could lead to a prolonged period when disease is controlled with people remaining well and able to participate in family, work, and social activities
- Based on clinical experience, improvement of PFS and tumour responses relate to symptom control and subsequently better quality of life
- Special attention needs to be given to the risk of ILD (interstitial lung disease). Education is key. There should be an agreement in place regarding lung imaging in each institute

Unmet need for therapies that control disease progression for longer periods (by increasing progression free survival), extend life (by increasing overall survival) and have an acceptable tolerability and safety

T-D produces unprecedented response rates and may offer survival improvements

T-D is believed to be a therapeutic advancement due to its improved PFS rates compared with T-emtansine

# Trastuzumab deruxtecan

Table 2 information about trastuzumab deruxtecan

|                                  |  |
|----------------------------------|--|
| <b>Marketing authorisation</b>   | <ul style="list-style-type: none"><li>• Monotherapy for unresectable or metastatic HER2-positive breast cancer after one or more prior anti-HER2-based regimens</li><li>• No stopping rule in marketing authorisation</li></ul>  |
| <b>Mechanism of action</b>       | <ul style="list-style-type: none"><li>• T-D - monoclonal antibody (trastuzumab) linked to a potent membrane-permeable topoisomerase I inhibitor (deruxtecan)</li><li>• Trastuzumab selectively binds to HER2. Once bound, it is taken into the cell, carrying deruxtecan with it, which damages tumour cell DNA, resulting in cell death</li></ul> |
| <b>Dosage and administration</b> | <ul style="list-style-type: none"><li>• IV infusion 3 weekly (21-day cycle) until disease progression or unacceptable toxicity. The recommended dosage is 5.4 mg/kg</li></ul>  |
| <b>Price</b>                     | <ul style="list-style-type: none"><li>• List price per 100mg vial = £1,455</li><li>• List price for 12 months of treatment = ~£85,000</li><li>• A simple discount patient access scheme has been approved which is confidential</li></ul>  |

Decision problem: The population, intervention, comparators and outcomes in the company submission in line with the NICE scope



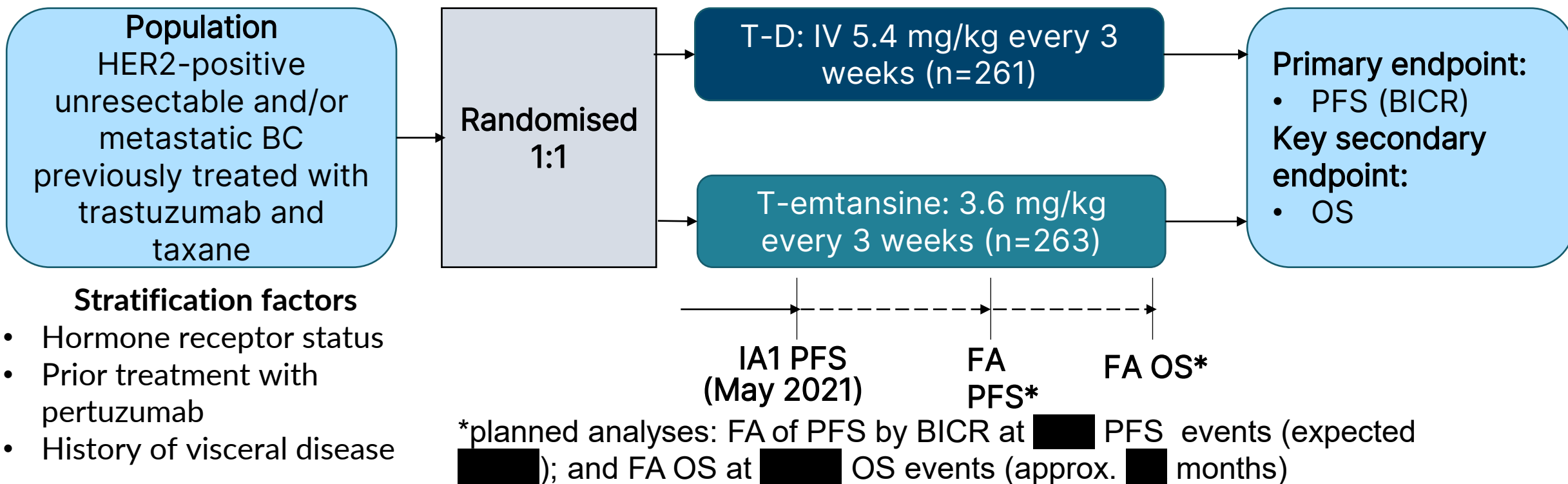
# Clinical effectiveness

# Key clinical trial - DESTINY-Breast03

*Data for this submission from interim analysis May 2021*

- Compared T-D with T-emtansine
- Phase III, multicentre, open-label, randomised, active-controlled, trial. 1:1 assignment was in parallel
- 169 centres in 15 countries; (North America, Europe (including UK), Asia, Australia, Brazil)

Figure 2 DESTINY-Breast03 study design



Abbreviations: BC, breast cancer; BICR, blinded independent central review; DOR, duration of response; FA, final analysis; HER2, human epidermal growth factor receptor 2; IA1, interim analysis; ORR, objective response rate; OS, overall survival; PFS, progression-free survival; T, trastuzumab; T-D, trastuzumab deruxtecan



# Generalisability of trial

*Baseline characteristics may not reflect characteristics of those in England*

## Background

- D-B03 was an international study with [REDACTED] patients enrolled in UK

| Differences from UK                     | Company response → subgroup analysis   |
|---|--|
| > proportion of Asian family background | [REDACTED] for HR between people with Asian and non-Asian family background → [REDACTED] of Asian family background. TEAEs also suggest [REDACTED] |
| < proportion of smokers                 | Subgroup analysis of never smoked and current or former smokers showed [REDACTED] of T-D vs T-emtansine in both groups                             |
| > likelihood of Prior lines of therapy  | Pre-specified & post-hoc analyses = no difference PFS based on lines of prior therapy  |
| Assumed = European population           | PFS by BICR showed [REDACTED] for T-D vs T-emtansine   |

## EAG comments

- Small number in European subgroup is insufficient to rule out differences in outcome between regions → some uncertainties regarding generalisability to the NHS remain
- Subgroup analyses unable to assess impact of covariates or confounding

Are the results from DESTINY-Breast03 generalisable to NHS practice?

# Clinical evidence - DESTINY-Breast03 results

## PFS by BICR, and OS

Figure 3 Kaplan-Meier of PFS by BICR

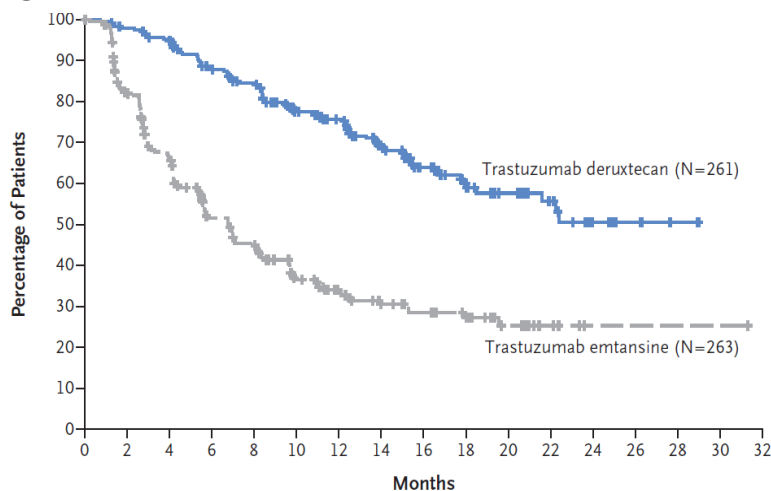


Table 3 Analysis of PFS by BICR

| PFS                              | T-D (n=261)               | T-emtansine (n=263) |
|----------------------------------|---------------------------|---------------------|
| Disease progression or death (%) | 87 (33.3%)                | 158 (60.1%)         |
| Median PFS, months (95% CI)      | NR (18.5-NE)              | 6.8 (5.6-8.2)       |
| 12-month PFS, % (95% CI)         | 75.8% (69.8-80.7)         | 34.1 (27.7-40.5)    |
| PFS HR (95% CI)                  | 0.28 (0.22-0.37), p<0.001 |                     |

Figure 4 Kaplan-Meier of OS

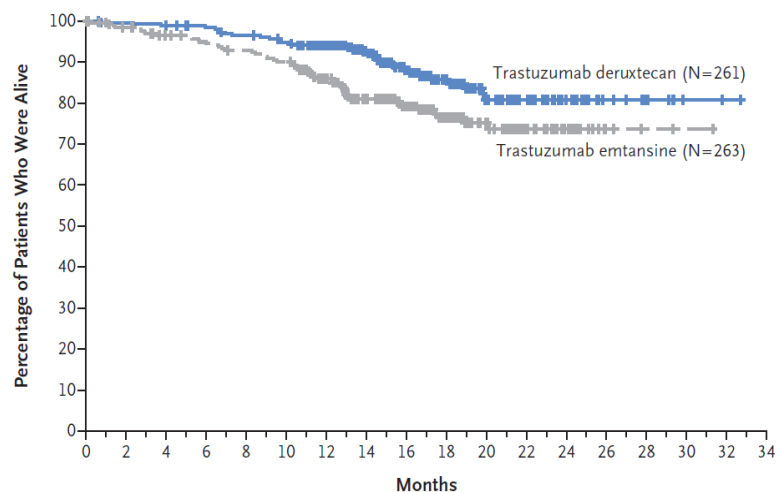


Table 4 Analysis of OS

|                            | T-D (n=261)               | T-emtansine (n=263) |
|----------------------------|---------------------------|---------------------|
| No. alive (%)              |                           |                     |
| Median OS (95% CI); months | NE (NE, NE)               | NE (NE, NE)         |
| 12-month OS (95% CI); %    | 94.1 (90.3-96.4)          | 85.9 (80.9-89.7)    |
| OS HR (95% CI)             | 0.55 (0.36-0.86), p=0.007 |                     |



# Immature OS data

## EAG

- Complete evidence for PFS but limitations in length of follow-up of OS to determine survival gain
  - 46.76% of PS events
  - ██████% of OS events → data immature

## Company

- PFS is a meaningful outcome and improvements in PFS are value, statistically significant 72% lower risk of progression or death compared with T-emtansine
- Efficacy of T-D confirmed through other meaningful endpoints, including response rates
- 17.9 month increase in median PFS in D-B03 (IA\*) for T-D vs. T-emtansine, is expected to translate into a statistically significant OS advantage
- Literature supports PFS as surrogate for OS and correlation between HRs of PFS/OS in HER2+ mBC
- OS benefit evidenced by early separation of KM curves to end of follow-up
- OS estimates from D-B03 have been compared with EMILIA and other studies, and validated by clinical and health economics and outcomes research experts, are appropriate

\*Median PFS by BICR is not available for T-D at the first interim analysis

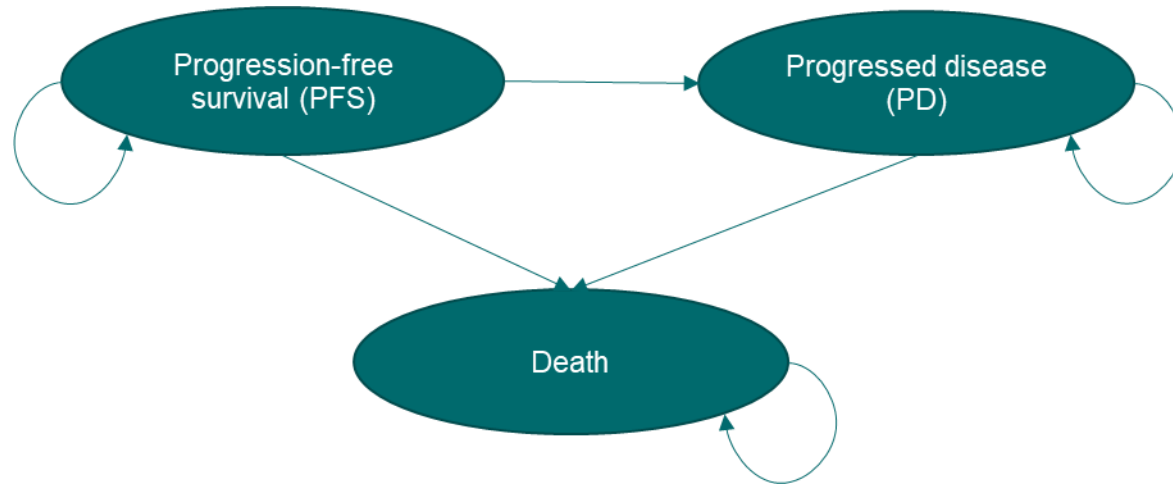


Is the interim data for OS sufficient to estimate relative effectiveness for decision making?

# Cost effectiveness

# Company model overview

Figure 5 Model structure



## Technology affects costs by:

- Extended drug treatment with T-D, raises drug costs
- Different incidences of adverse events
- Different time periods in the PF and PD health states

## Technology affects QALYs by:

- Longer OS with T-D (main driver)
- Utility benefit with T-D due to longer time spent in PFS

## Assumptions with greatest ICER effect:

- Whether an OS benefit is sustained across the 30-year time horizon of the model
- Utility values for the progression-free survival and the disease progression health states
- Vial wastage

Abbreviations: ICER, Incremental cost-effectiveness ratio; OS, Overall survival; PD, progressed disease; PF, progression free; PFS, progression free survival; QALY, quality adjusted life year; T-D, trastuzumab deruxtecan

# How company incorporated evidence into model

**Table 6** Input and evidence sources

| Input                                | Assumption in company base case and evidence source  |
|--------------------------------------|--|
| Baseline characteristics             | From D-B03: Mean age = █████ years   |
| Intervention and comparator efficacy | OS: Generalised gamma parametric curve fitted to D-B03 data (with a treatment covariate for T-D)<br>PFS and TTD: Weibull parametric curve fitted to D-B03 data   |
| Utilities                            | Pre progression - Treatment specific utilities derived from D-B03 used directly by mapping EQ-5D-5L to EQ-5D-3L using Van Hout algorithm<br>Post progression - Treatment specific utilities derived from Lloyd et al, 2006 |

Abbreviations: AEs, adverse events; D-B03, DESTINY-Breast03; OS, overall survival; PD, progressed disease; PF, progression free; PFS, progression free survival; PSSRU, Personal Social Services Research Unit; T-D, trastuzumab deruxtecan; TTD, time to treatment discontinuation



# Summary of company and EAG base case assumptions

Table 7 Assumptions in company and EAG base case

| Assumption   | Company base case   | EAG base case  | Inc. costs | Inc. QALY | ICER impact |
|--|---|--|------------|-----------|-------------|
| PFS extrapolation  | Weibull   |  | -          |           |             |
| OS extrapolation of T-E                                      | Direct extrapolation of DB03  |  | -          |           |             |
| OS extrapolation of T-D (treatment effect after progression) | Treatment specific effect extrapolated beyond follow up period            | Extrapolation until year 2 then no treatment effect after progression* | ↓          | ↓         | ↑           |
| Utilities  | PFS = DB-03 (treatment specific)<br>PD = Lloyd et al (treatment specific) | PFS = DB03 (treatment specific)<br>PD = Lloyd et al (combined)         | =          | ↓         | ↑           |
| Vial wastage   | Assume no vial wastage occurs in 50% of cases for T-D                     | Assume no vial wastage occurs in 10% of cases for T-D                  | ↑          | =         | ↑           |

- \* ██████ in T-D arm of the trial were still alive at interim data cut → OS extrapolation uncertain

# Uncertain OS predictions for T-D

## *Treatment effect beyond progression is uncertain*



Company provided 2 methods to extrapolate OS beyond interim data-cut point:

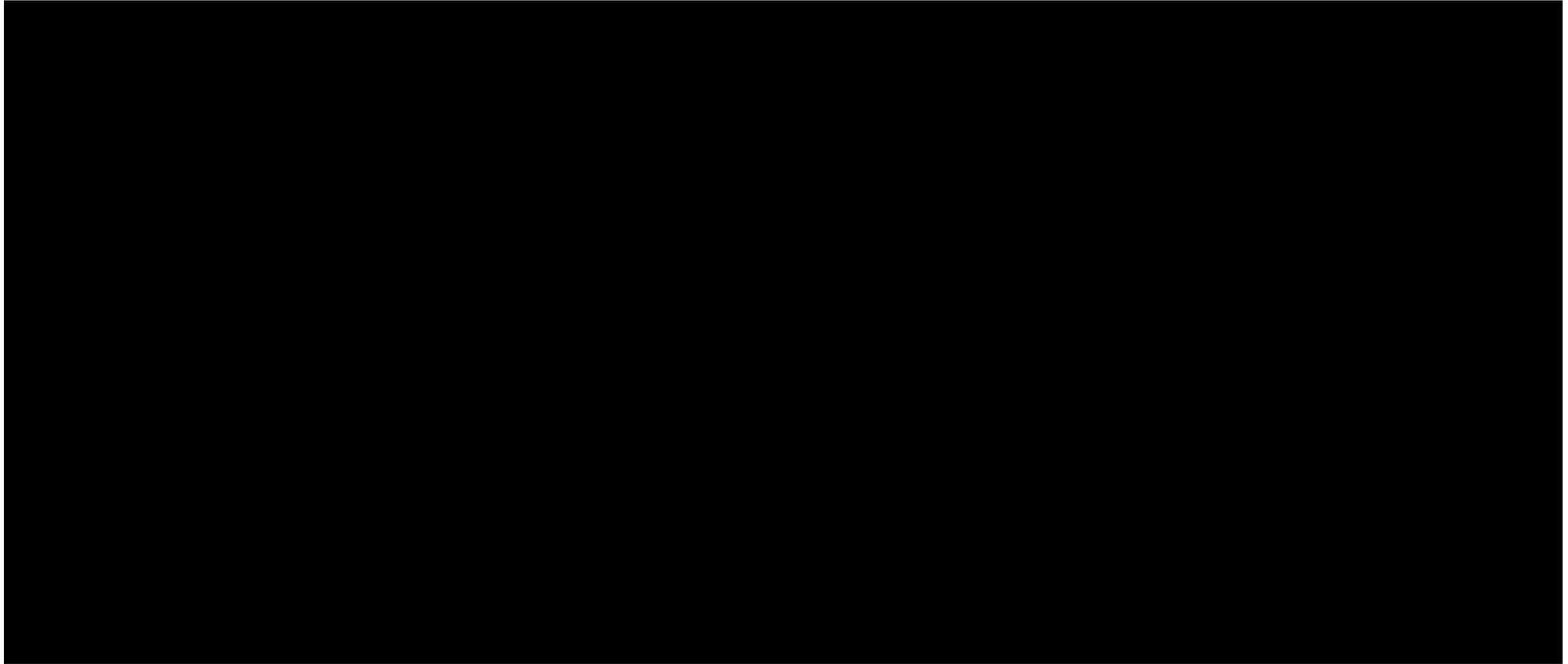
- 1) Company base case = fitted dependent survival models to D-B03 data: generalised gamma
- 2) Patient level data replicated from T-emtansine arm of EMILIA study, parametric survival models fitted to replicated data to predict T-emtansine OS, with HR from D-B03 applied to this curve to predict T-D OS

### EAG

- Company assumed trend in overall survivor curve as the proportion of people alive progression free within trial follow-up, and will continue beyond follow-up period
- EAG: strong assumption given immature data, the effect of changing disease profile over time, and the change in treatments received.
- Without survival data post progression, not clear if there is a treatment effect after progression when treatment stops
- Considered 2 alternative assumptions extrapolating OS beyond 2 years:
  - A. conservative scenario with no treatment effect beyond disease progression;
  - B. less conservative assumption where treatment effect wanes over time, determined by proportion of people still alive who are in PD state
- ***Assumption A in EAG base case:*** assumes risk of death equal for all people in post progression

# Uncertain OS predictions for T-D

*Treatment effect beyond progression is uncertain*



# Uncertain OS predictions for T-D

## *Treatment effect beyond progression is uncertain*



### Company TE response

- Acknowledge OS data for D-B03 immature. Consider uncertainty has been explored through clinical validation, and testing of structural and parameter uncertainty within economic model:
- Treatment waning:
  - No evidence of treatment waning with T-D or after 2 years hazards start merging
  - Prior HER2+ BC appraisals did not assume OS treatment waning
  - In previous metastatic HER2+ BC trials, no evidence of treatment waning for HER2+ targeted treatments when comparing interim outcomes with final analysis sets with longer-term follow-up

### EAG comments

- 'Treatment waning' is different: assumes mortality HR post-progression in T-D arm is lower than T-emtansine arm to start with, but this gradually reduces to zero (around year 8).
- May be biological/statistical reasons for mortality hazard rates lower in T-D than T-emtansine arm post-progression. Evidence for sustained lower mortality hazard rates post-progression not produced



Is an assumption of a benefit post progression acceptable?

# Post-progression utility values

## *PD utilities: Treatment specific or treatment independent?*



### Background

- Treatment specific utility values for PF health state are derived from D-B03 and treatment specific utility values for PD health state derived from Lloyd et.al (2006) in company base case

### EAG comments

- No evidence in Lloyd et al. (which was used as the source for PD utility estimates in the company's base case model) or in the CS for a difference in PD utility values across treatment groups
- Uncertain the difference in utility values, accounting for uncertainty in the estimates, would be generalisable to the English setting.
- Compared to other health state utilities in previous TAs, the values for PFS and PD differ
- Question how valid treatment-specific progressed disease utilities are. Once people are off-treatment, utility values would be the same for both arms within a very short timeframe

### Clinical and patient expert comments

- Difficult to estimate difference in post-progression utilities. Higher for people who progress on T-D for a period of time compared to T-emtansine. Disease under control for longer period and longer response rates
- People starting new treatment with less tumour burden, symptoms and potentially improved QoL

# Post-progression utility values

*PD utilities: Treatment specific or treatment independent?*



## Company

- Number of post-progression observations from D-B03 limited (670 out of 4,644 total) and values implausibly high. No long-term data for HRQoL for PD was collected
- Precedent of different utility values being used in prior breast cancer appraisals (TA786 and TA819)
- At TE, explored utility benefit for T-D last for period after progression then same utility for T-D and T-emtansine. 2 time points : 1) 6 months (from TA819), 2) 4 months, last collected EQ-5D from D-B03
- Assuming a utility benefit for a shorter timeframe increases the ICER slightly from the base case

## EAG comments

- T-D associated with higher responses rates (79.7% vs 34.2%) but lack of evidence that HRQoL is greater in T-D post-progression than in T-emtansine post-progression

## Other considerations (previous appraisals)

- TA819: 4 approaches, all associated with uncertainties and none satisfactory. Concluded company revised base case with carry-over utility benefit for 6 months was least flawed approach
- TA786: Concluded differences in post-progression health state utilities are plausible, but uncertain

# Post-progression utility values



*PD utilities: Treatment specific or treatment independent?*

Table 9 Utility values from this appraisal and previous appraisals

|            | Treatment                              | Source  | PD     |
|------------|--|---|--------|
| ID3909     | T-D                                    | Coefficients from Lloyd et.al (2006) used to calculate treatment specific utilities by responder and non-responder weighted by response rates from DESTINY-Breast03 study | 0.6183 |
|            | T-emtansine                            |   | 0.5738 |
|            | Combined from Lloyd et.al (2006)       | Average of treatment specific utilities   | 0.5960 |
| TA598 – 1L | Pertuzumab + trastuzumab + docetaxel   |   | 0.769  |
| TA458 – 2L | T-emtansine                            |   | 0.53   |
| TA704 – 3L | T-D                                    |   | 0.588  |
| TA786 – 3L | Tucatinib + trastuzumab + capecitabine |   | 0.698  |
|            | Eribulin                               |   | 0.588  |
| TA819 – 3L | Sacituzumab vs physician's choice      | Utility difference between treatments = 0.084   |        |

- EAG accepted Lloyd as a background source for utility data. But did not accept differential post-progression utilities for T-D and T-emtansine



Are the treatment specific or treatment independent utility values reasonable?

# Vial wastage



## EAG comments

- Company has over-estimated ability for vial sharing
- Consulted clinical experts advised that vial sharing does not happen or if it does, dependent on circumstances of each clinic → vial sharing not be considered, or considered at lower rate than 50%
- When vial sharing is carried out it is also unlikely that perfect allocation of each dose occurs
- Adopted alternative waste value of vial sharing in 10% of cases (i.e. 90% of cases resulting in waste)

## Company

- Vial sharing available in some UK centres, model includes an option to assume a proportion of people vial share. Base case = 50% vial sharing
- Previous appraisals have considered 50% an appropriate assumption (TA819, TA704)
- Consider 50% more appropriate than 10% and consistent with previously accepted assumptions

## Other considerations (previous appraisals)

- TA819: committee accepted 50% is a reasonable assumption for vial sharing
- TA458: committee concluded that some wastage needs to be included in the calculation of trastuzumab emtansine treatment costs, because assuming no wastage is not plausible (company base case 50%)



Is an assumption of no vial wastage occurring in 10% or 50% of cases for trastuzumab deruxtecan appropriate for decision making?



# QALY weightings for severity (1)

New severity modifier calculations and components:



QALYs people without the condition  
(A)



QALYs people with  
the condition (B)



**Health lost by people with the condition:**

- Absolute shortfall: total =  $A - B$
- Proportional shortfall: fraction =  $(A - B) / A$
- \*Note: The QALY weightings for severity are applied based on **whichever of absolute or proportional shortfall implies the greater severity**. If either the proportional or absolute QALY shortfall calculated falls on the cut-off between severity levels, the higher severity level will apply

Table 10 QALY weightings for severity of the disease

| QALY weight | Absolute shortfall (AS) | Proportional shortfall (PS) |
|-------------|-------------------------|-----------------------------|
| 1           | Less than 12            | Less than 0.85              |
| X 1.2       | 12 to 18                | 0.85 to 0.95                |
| X 1.7       | At least 18             | At least 0.95               |

# QALY weightings for severity (2)

| Components  | Company                                | EAG                                    | Notes  |
|---|--|--|--|
| 1. QALYs of people without condition (based on trial population characteristics which both EAG and company agreed on) | 14.63                                  | 14.33                                  | Difference comes from the dataset used: <ul style="list-style-type: none"> <li>Company: EQ-5D-3L data from HSE 2012 and 2014 data and MVH value set</li> <li>EAG: HSE 2017/18 EQ-5D-5L plus Hernández et al algorithm.</li> </ul>                |
| 2. QALYs with the condition on current treatment  | ■                                      | ■                                      |  |
| 3. Results  |  |  |  |
| Absolute QALY shortfall (has to be >12)   | Deterministic = ■<br>Probabilistic = ■ | Deterministic = ■<br>Probabilistic = ■ | <b>EAG comments:</b> <ul style="list-style-type: none"> <li>Hernández preferred in NICE methods 2022 for mapping EQ-5D-5L to EQ-5D-3L, therefore the same algorithm should be used in estimating QALYs with and without the condition</li> </ul> |
| Proportional QALY shortfall (has to be >0.85)   | Deterministic = ■<br>Probabilistic = ■ | Deterministic = ■<br>Probabilistic = ■ |  |

  Severity threshold met for 1.2x QALY weighting



Does the condition qualify for a QALY weighting based on severity of disease as defined by associated absolute or proportional QALY shortfall?

HSE, Health Survey for England; MVH, Measuring and Valuing Health; QALY, Quality-adjusted life year

# Other considerations

## Equality considerations

- No equality issues have been raised

## Innovation

- T-D is an innovative treatment based on its potential to make a significant and substantial impact on health-related benefits, representing a step-change in management vs. T-emtansine.
- T-D is an antibody-drug conjugate, and the first to combine an anti-HER2 antibody (trastuzumab) with a topoisomerase inhibitor licensed in the UK
- The Innovative Licensing and Access Pathway (ILAP) Steering Group (MHRA, NICE, All Wales Therapeutics and Toxicology Centre (AWTTC), Scottish Medicines Consortium (SMC), and representatives from the ILAP Patient and Public Reference Group), informed Daiichi Sankyo that the innovative medicine designation, the Innovation Passport, has been awarded for T-D on the basis of the DESTINY-Breast03 trial.
- Therapeutic advancement due to its improved PFS rates and duration of response compared with current standard of care which is T-emtansine

# Managed access

## Criteria for a managed access recommendation

The committee can make a recommendation with managed access if:

- the technology cannot be recommended for use because the evidence is too uncertain
- the technology has the **plausible potential** to be cost effective at the **currently agreed price**
- new evidence that could **sufficiently support the case for recommendation** is expected from ongoing or planned clinical trials, or could be collected from people having the technology in clinical practice
- data could feasibly be collected within a reasonable timeframe (up to a **maximum of 5 years**) without **undue burden**.

# Cost-effectiveness results

As confidential discounts are available for comparators and subsequent treatments in the pathway, ICERs are not reported in Part 1.

ICERs including confidential discounts will be presented in Part 2.

## Summary

- Company's base case is > £30k/QALY gained
- EAG's base case > £30k/QALY gained
  - Includes no treatment effect beyond progression,
  - a single combined PD utility and
  - 90% vial wastage,

## Scenario analysis

The following scenarios will be presented alongside the company and EAG base case

- Varied proportion receiving subsequent treatments
- Varied distributions of subsequent treatments
- Different PFS extrapolations
- Different OS extrapolations
- Alternative OS approach using EMILIA data
- 6 and 4 month utility benefit for T-D in PD

## NICE

Abbreviations: ICER, incremental-cost effectiveness ratio, OS, overall survival; PD, progressed disease; PFS, progression free survival; T-D, trastuzumab deruxtecan

**Thank you.**