

# Gastric and Gastroesophageal Junction Adenocarcinoma

US Food & Drug Administration  
Oncologic Drugs Advisory Committee  
September 26, 2024

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**Ian Waxman, MD**

Vice President,  
Late Development Oncology

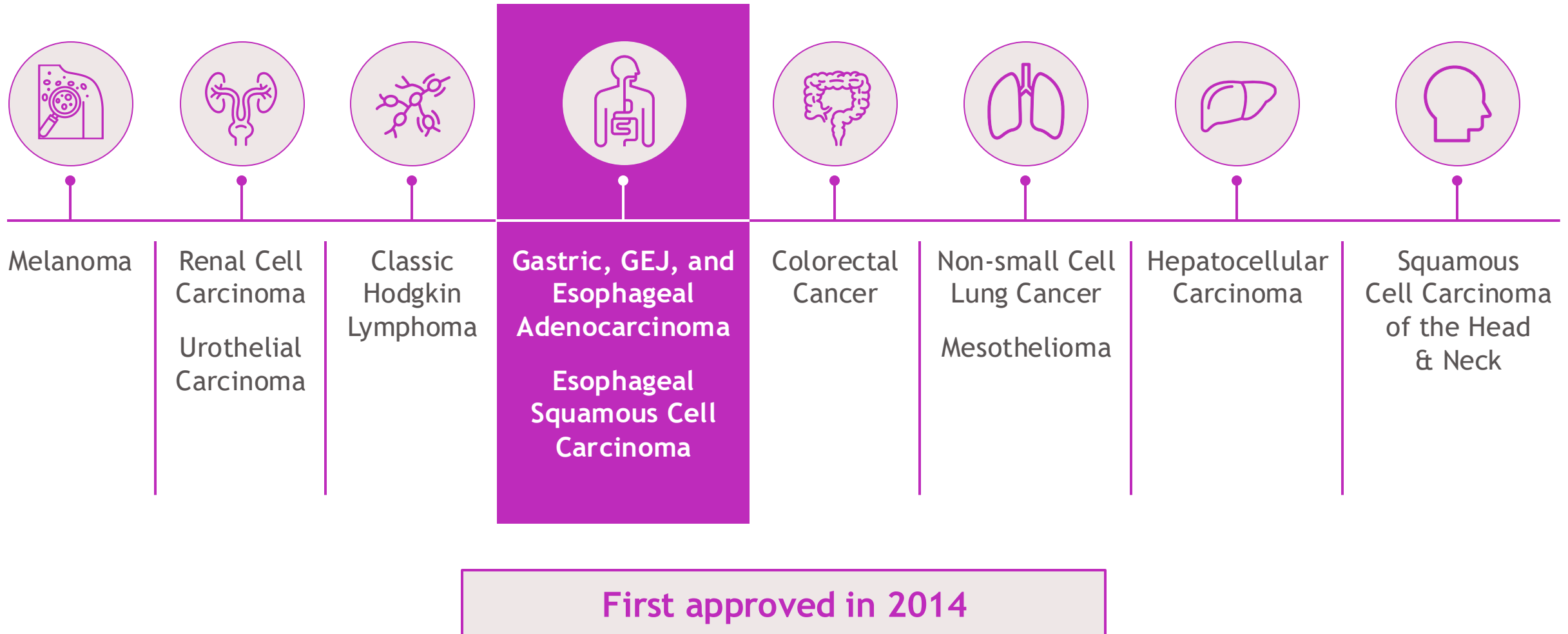
**BMS**



# Introduction

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# Opdivo Approved for 11 Cancer Types in United States



# Opdivo® (nivolumab) Fully Approved for Gastric Cancer on April 16, 2021

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Treatment of adult patients with advanced or metastatic gastric cancer, gastroesophageal junction cancer, and esophageal adenocarcinoma in combination with fluoropyrimidine and platinum-containing chemotherapy.

**No restriction based  
on PD-L1 status**

# Current US Prescribing Information Includes Data by PD-L1 Expression Level in Section 14.13

**Table 76: Efficacy Results - CHECKMATE-649**

	OPDIVO and mFOLFOX6 or CapeOX (n=789)	mFOLFOX6 or CapeOX (n=792)	OPDIVO and mFOLFOX6 or CapeOX (n=641)	mFOLFOX6 or CapeOX (n=655)	OPDIVO and mFOLFOX6 or CapeOX (n=473)	mFOLFOX6 or CapeOX (n=482)
	All Patients		PD-L1 CPS $\geq$ 1		PD-L1 CPS $\geq$ 5	
<b>Overall Survival</b>						
Deaths (%)	544 (69)	591 (75)	434 (68)	492 (75)	309 (65)	362 (75)
Median (months) (95% CI)	13.8 (12.6, 14.6)	11.6 (10.9, 12.5)	14.0 (12.6, 15.0)	11.3 (10.6, 12.3)	14.4 (13.1, 16.2)	11.1 (10.0, 12.1)
Hazard ratio (95% CI) <sup>a</sup>	0.80 (0.71, 0.90)		0.77 (0.68, 0.88)		0.71 (0.61, 0.83)	
p-value <sup>b</sup>	0.0002		<0.0001		<0.0001	

In an exploratory analysis in patients with PD-L1 **CPS <1 (n = 265)**, the median OS was 13.1 months (95% CI: 9.8, 16.7) for the OPDIVO and chemotherapy arm and 12.5 months (95% CI: 10.1, 13.8) for the chemotherapy arm, with a stratified **HR of 0.85 (95% CI: 0.63, 1.15)**.

In an exploratory analysis in patients with PD-L1 **CPS <5 (n = 606)**, the median OS was 12.4 months (95% CI: 10.6, 14.3) for the OPDIVO and chemotherapy arm and 12.3 months (95% CI: 11.0, 13.2) for the chemotherapy arm, with a stratified **HR of 0.94 (95% CI: 0.78, 1.14)**.

CPS subgroup data, based on Agilent/Dako PD-L1 IHC 28-8 pharmDx test, provided in the clinical trial section.

# NCCN Guidelines Complement Information Included in Opdivo Label

## Recommended Population to Treat

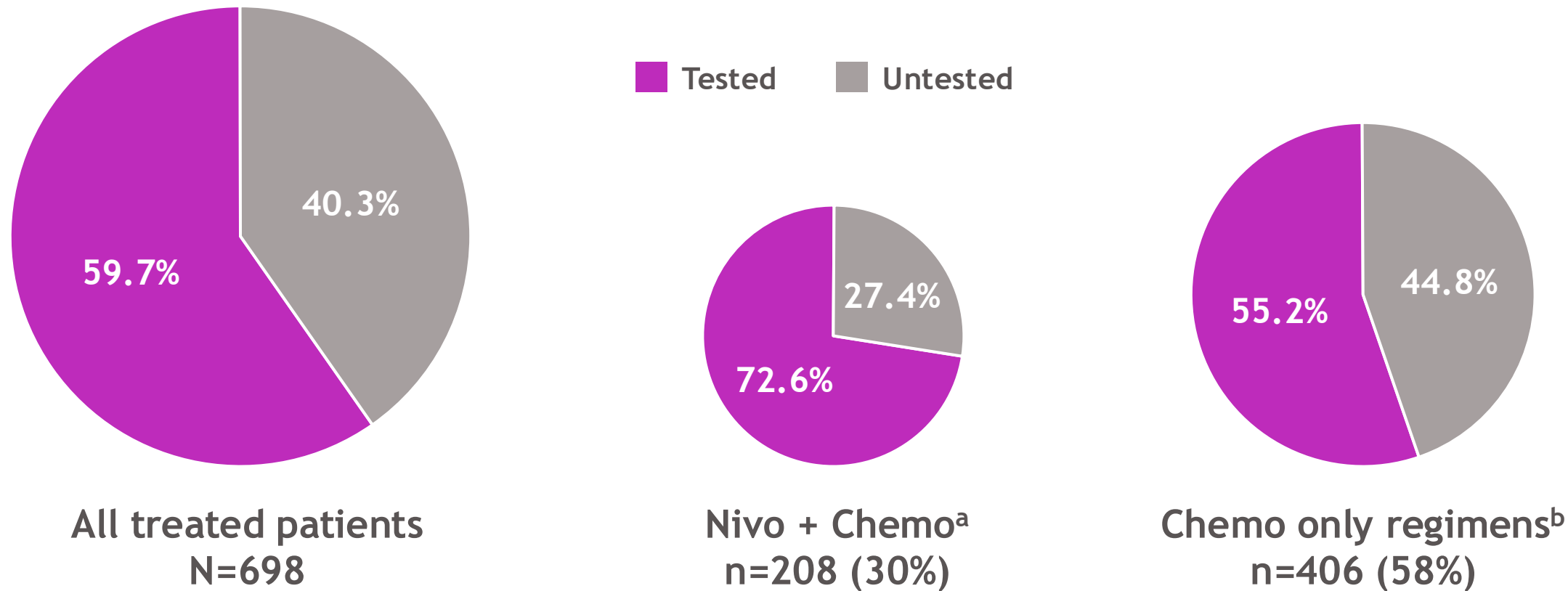
Tumor Type	Recommended First-line Regimen	USPI <sup>1</sup>	NCCN <sup>2</sup>
Gastric, GEJ, and Esophageal Adenocarcinoma	Nivolumab + fluoropyrimidine, and platinum-containing chemotherapy	No restriction	CPS $\geq 5$ <sup>Cat 1</sup> CPS $< 5$ <sup>Cat 2B</sup>
	Pembrolizumab + fluoropyrimidine, and platinum-containing chemotherapy	No restriction	CPS $\geq 10$ <sup>Cat 1</sup> CPS 1 - $< 10$ <sup>Cat 2B</sup>
	Tislelizumab + chemotherapy	TBD	TBD

<sup>1</sup>Opdivo USPI.

<sup>2</sup>NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) Gastric Cancer. Version 4.2024 – August 12, 2024.

# PD-L1 CPS Testing Patterns – US Flatiron Analysis

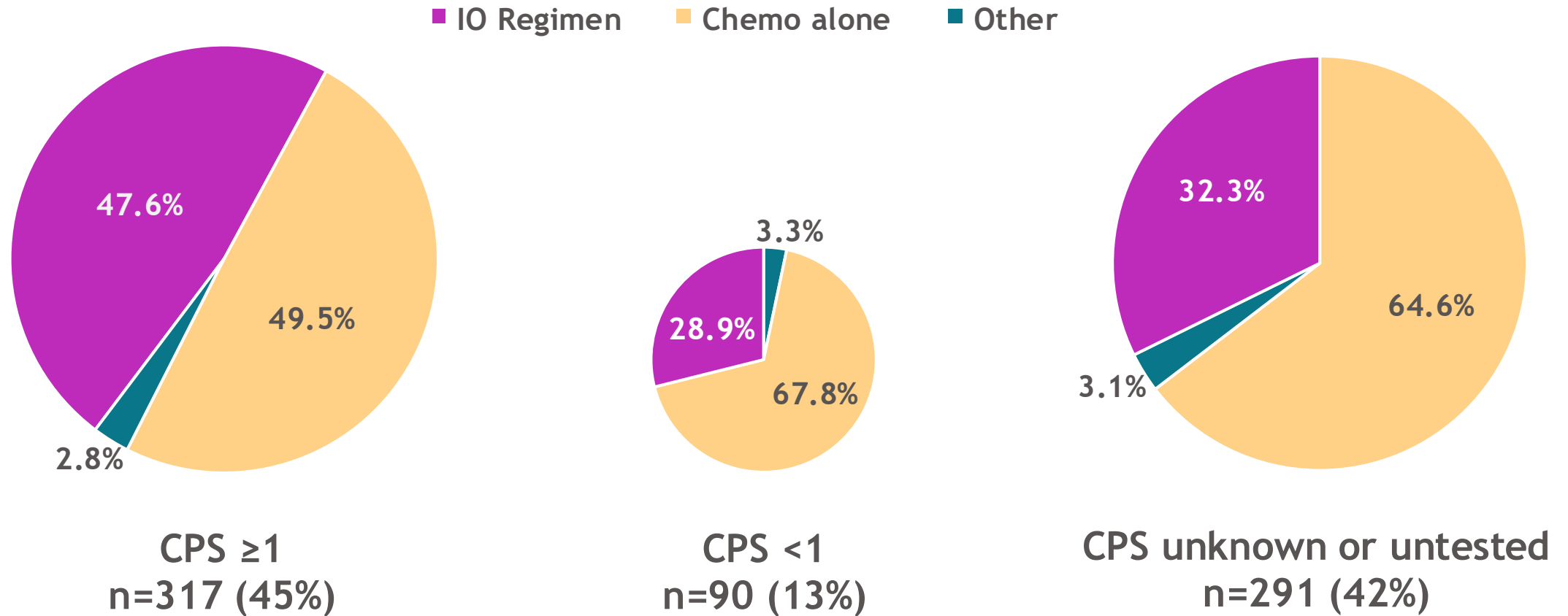
Gastric, GEJ, and Esophageal Adenocarcinoma



Testing patterns among patients diagnosed with advanced/metastatic GC/GEJC/EAC from January 2023 to March 2024 using the Flatiron database. PubD 00065829. Princeton, NJ: Bristol-Myers Squibb Company; 2024.  
<sup>a</sup>Chemo regimens in this group included FOLFOX/CAPEOX/FP/XP; <sup>b</sup>Chemo only regimens included FOLFOX/CAPEOX/FP/XP and other chemo groups.

# First-Line Treatment Patterns – US Flatiron Analysis (N=698)

Gastric, GEJ, and Esophageal Adenocarcinoma



1L treatment patterns among advanced GC/GEJC/EAC patients diagnosed from January 2023 to March 2024 by PD-L1 CPS cutoff 1 using the Flatiron database.  
PubD 00065829. Princeton, NJ: Bristol-Myers Squibb Company; 2024.



# What We're Here to Discuss

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Potential changes to the product label based on PD-L1 expression

2 ✓

We desire to do what's right for patients and ensure that information provided to physicians and patients is clear

3 ✓  
✓  
✓

Important challenges in seeking harmonization

# Potential Labeling Options

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## Modify the indication to PD-L1 positive (PD-L1 CPS $\geq$ 1)

### Benefit:

- Limits treatment to patients most likely to benefit based on clinical trial data

### Considerations:

- PD-L1 is a dynamic biomarker and expression is heterogeneous; therefore, some patients may be incorrectly identified as PD-L1 negative
- Some patients may have inadequate tumor tissue for biomarker testing
- Choice of a cut-off higher than CPS 1 is challenging given variability in CPS scoring in clinical practice

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## Keep current indication

### Benefit:

- Provides physicians/patients an opportunity to make informed decisions on an individual patient basis based on USPI and NCCN guidelines

### Considerations:

- Raises concerns about exposing patients who are less likely to benefit to additional toxicity

# Agenda

## Benefit Risk Profile in PD-L1 Subgroups



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**Dana Walker, MD, MSCE**  
Vice President,  
Global Program Lead,  
Opdivo/Yervoy, GI and GU  
BMS

## PD-L1 Testing in Clinical Practice



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**Robert A. Anders, MD, PhD**  
Division of GI and  
Liver Pathology  
The Johns Hopkins University

## Conclusion



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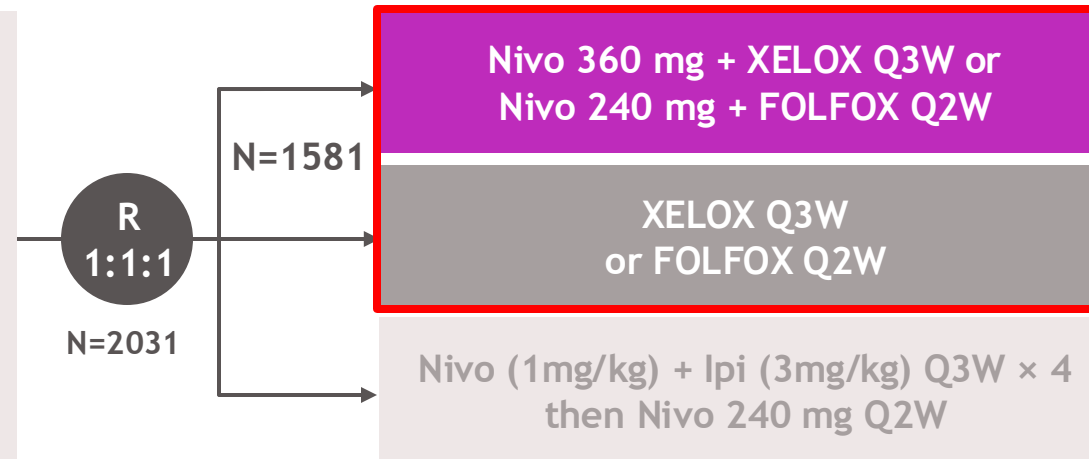
# Benefit Risk Profile in PD-L1 Subgroups

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# CheckMate 649 Study Design

## Key eligibility criteria

- Previously untreated, unresectable, advanced or metastatic gastric/GEJ/esophageal adenocarcinoma
- No known HER2-positive status
- ECOG PS 0-1



## Primary endpoints:

- OS and PFS (CPS  $\geq 5$ )

## Secondary endpoints:

- OS (CPS  $\geq 10$ , 1, all randomized)<sup>a</sup>
- PFS (CPS  $\geq 10$ , 1, all randomized)
- ORR

## Exploratory endpoints:

- Safety
- QoL

## Stratification factors

- Tumor cell PD-L1 expression ( $\geq 1\%$  vs  $< 1\%$ )
- Region (Asia vs United States/Canada vs ROW)
- ECOG PS (0 vs 1)
- Chemo (XELOX vs FOLFOX)

## 28-8 Agilent/Dako IHC Assay

- PD-L1 TPS used for stratification
- PD-L1 CPS used for analysis

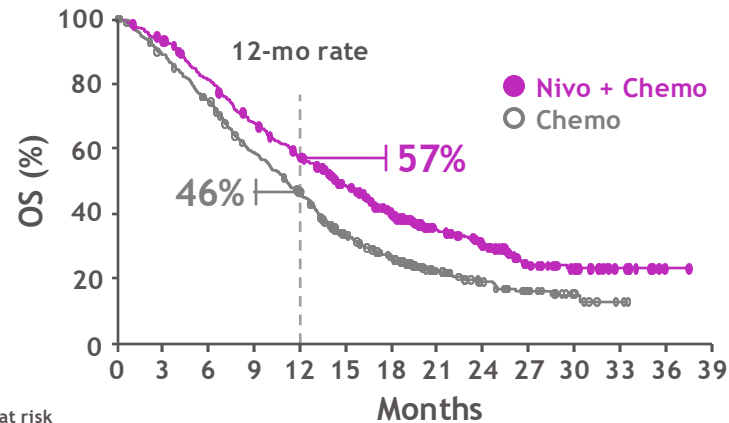
<sup>a</sup>OS in CPS  $\geq 1$  and all randomized populations were formally tested. Janjigian YY, et al. *Lancet*. 2021;398:27-40.

# Statistically Significant and Clinically Meaningful OS Benefit in Primary and Secondary Analysis Populations

## CheckMate 649

### Primary Endpoint PD-L1 CPS $\geq 5^a$

	Nivo + Chemo (n=473)	Chemo (n=482)
Median OS, mo	14.4	11.1
(95% CI)	(13.1-16.2)	(10.0-12.1)
HR (98.4% CI)	0.71 (0.59-0.86)	
P value	<0.0001	

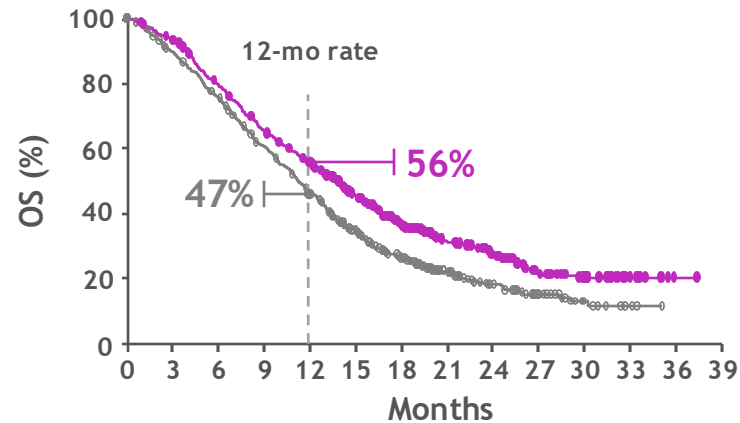


No. at risk

	473	438	377	313	261	198	149	96	65	33	22	9	1	0
Nivo + Chemo	473	438	377	313	261	198	149	96	65	33	22	9	1	0
Chemo	482	421	350	271	211	138	98	56	34	19	8	2	0	0

### PD-L1 CPS $\geq 1^a$

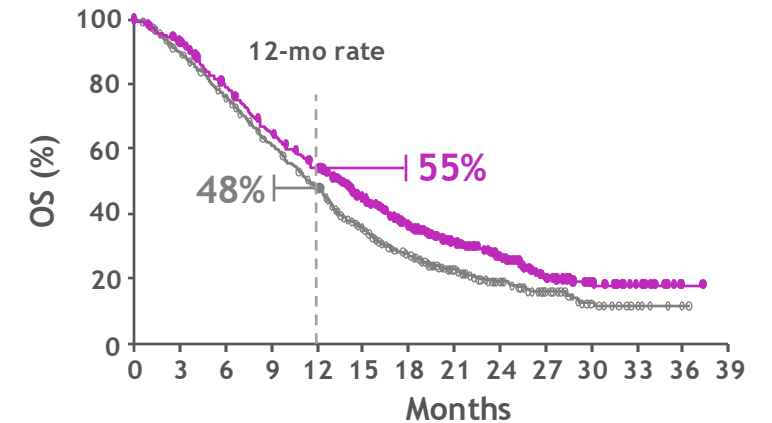
	Nivo + Chemo (n=641)	Chemo (n=655)
Median OS, mo	14.0	11.3
(95% CI)	(12.6-15.0)	(10.6-12.3)
HR (99.3% CI)	0.77 (0.64-0.92)	
P value	<0.0001	



	641	595	502	412	344	254	183	118	80	40	28	11	1	0
Nivo + Chemo	641	595	502	412	344	254	183	118	80	40	28	11	1	0
Chemo	655	575	483	383	292	194	131	77	45	25	10	3	0	0

### All randomized<sup>a</sup>

	Nivo + Chemo (n=789)	Chemo (n=792)
Median OS, mo	13.8	11.6
(95% CI)	(12.6-14.6)	(10.9-12.5)
HR (99.3% CI)	0.80 (0.68-0.94)	
P value	0.0002	

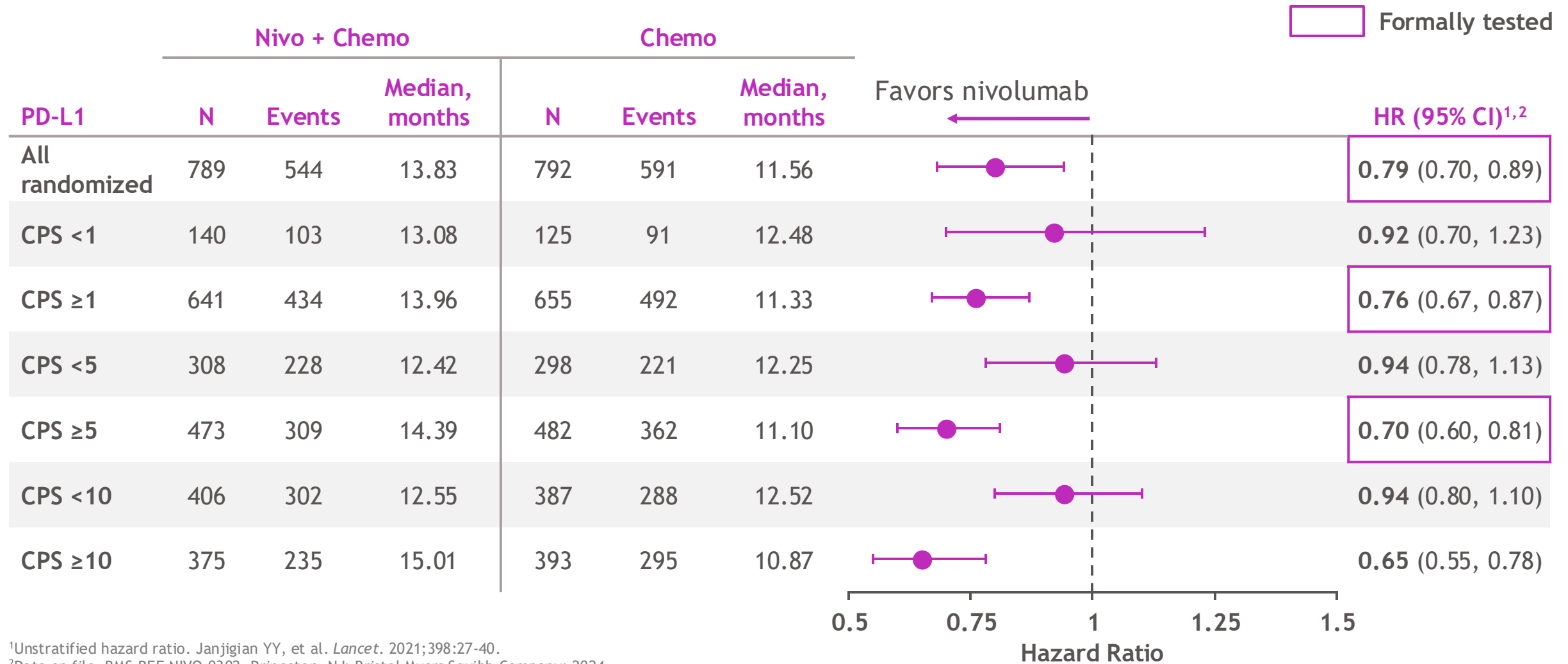


	789	731	621	506	420	308	226	147	100	49	34	14	2	0
Nivo + Chemo	789	731	621	506	420	308	226	147	100	49	34	14	2	0
Chemo	792	697	586	469	359	239	160	94	59	35	15	7	2	0

<sup>a</sup>Minimum follow-up 12.1 months. Stratified hazard ratio. Janjigian YY, et al. *Lancet*. 2021;398:27-40.

# Overall Survival Benefit in PD-L1 Subgroups

## CheckMate 649

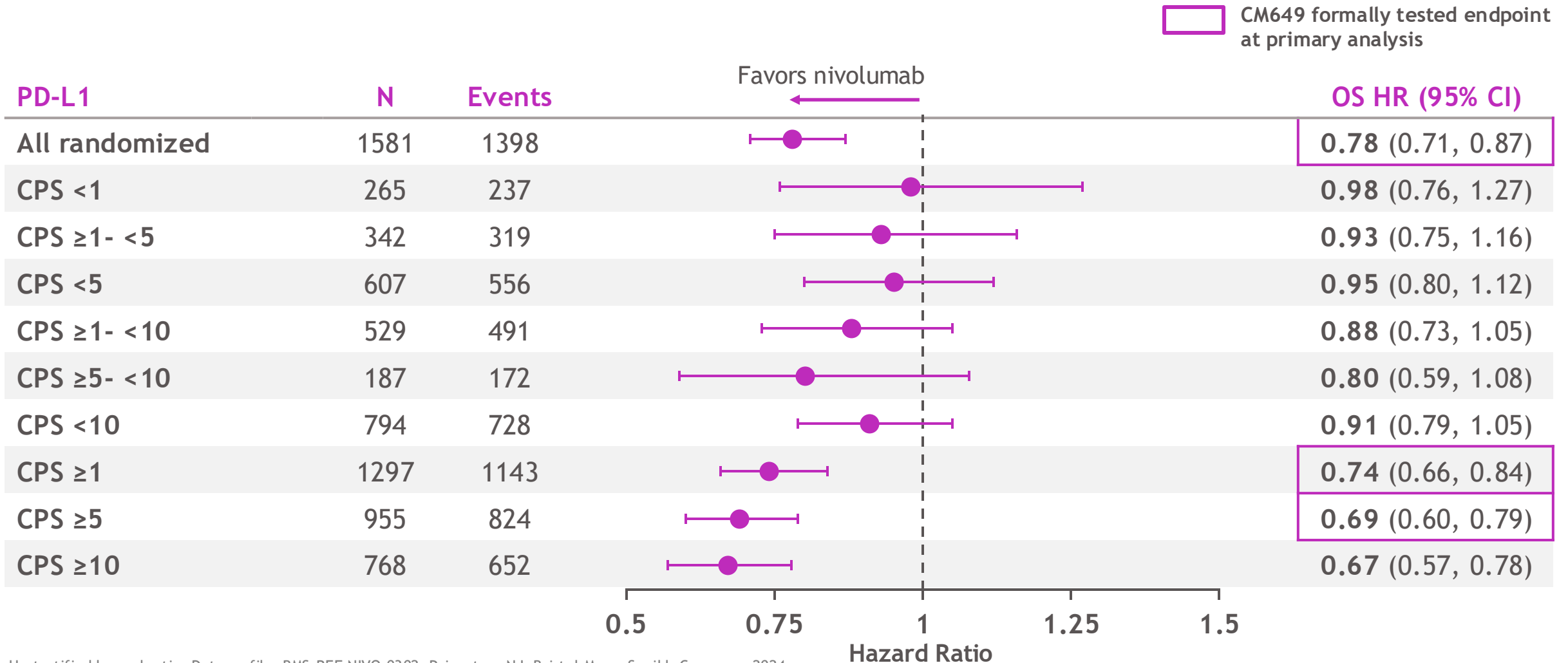


<sup>1</sup>Unstratified hazard ratio. Janjigian YY, et al. *Lancet*. 2021;398:27-40.

<sup>2</sup>Data on file. BMS-REF-NIVO-0302. Princeton, NJ: Bristol-Myers Squibb Company; 2024.

# Summary of OS Benefit by PD-L1 CPS in 1L Gastric Cancer

CheckMate 649, 4-year follow-up



Unstratified hazard ratio. Data on file. BMS-REF-NIVO-0302. Princeton, NJ: Bristol-Myers Squibb Company; 2024.



# Safety Profile of Nivo + Chemo Versus Chemo

CheckMate 649

	Patients, n (%) <sup>1</sup>	
	Nivo + Chemo N=782	Chemo N=767
All grade, all causality AEs	776 (99.2)	752 (98.0)
All grade, TRAEs	738 (94.4)	679 (88.5)
Grade 3/4	462 (59.1)	341 (44.5)
All grade, TRAEs leading to DC <sup>a</sup>	284 (36.3)	181 (23.6)
Grade 3/4	132 (16.9)	67 (8.7)
Treatment-related deaths	12 (1.5)	4 (0.5)

No difference in safety profile based on PD-L1 status

<sup>1</sup>Data on file. BMS-REF-NIVO-0302. Princeton, NJ: Bristol-Myers Squibb Company; 2024. <sup>a</sup>Reflects discontinuation (DC) of any component of a regimen.

# Summary – First-Line Treatment of Advanced/Metastatic Gastric, GEJ, and Esophageal Adenocarcinoma

- CM-649 demonstrated statistically significant and clinically meaningful OS benefit in the CPS  $\geq 5$ , CPS  $\geq 1$ , and all randomized populations
  - Exploratory analyses showed greater OS benefit in all PD-L1 positive subgroups by CPS
  - Long-term follow-up data are consistent with the data available at the time of approval
- The safety profile of Nivo + Chemo was consistent with the known safety profile of the individual drug components
  - Similar safety profile regardless of PD-L1 status
- Positive benefit risk profile in all PD-L1 positive subgroups by CPS

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**Robert A. Anders, MD, PhD**

Division of GI and Liver Pathology

The Johns Hopkins University

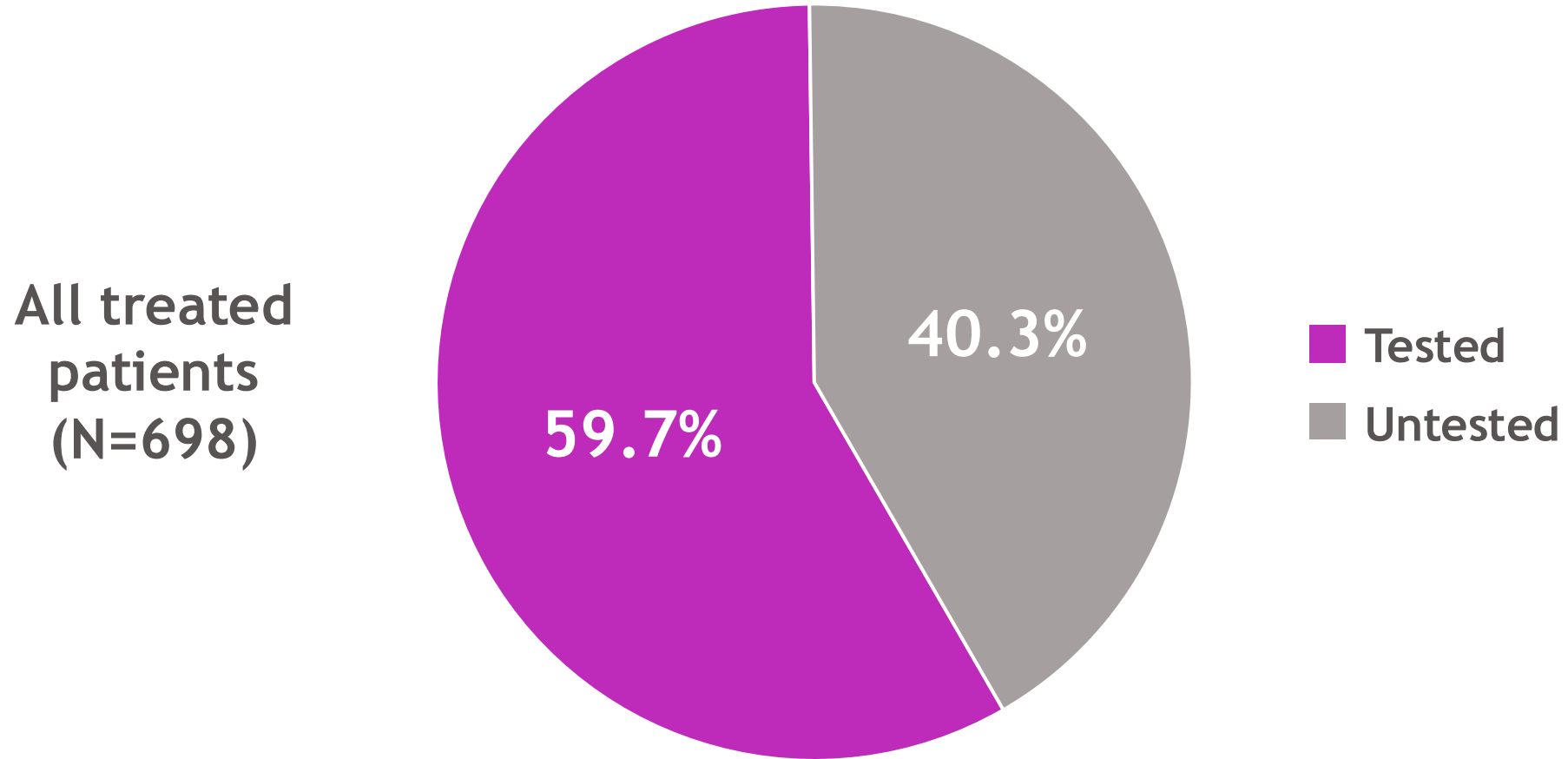


# PD-L1 Testing in Clinical Practice

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# Real-World PD-L1 CPS Testing Patterns – US Flatiron Analysis

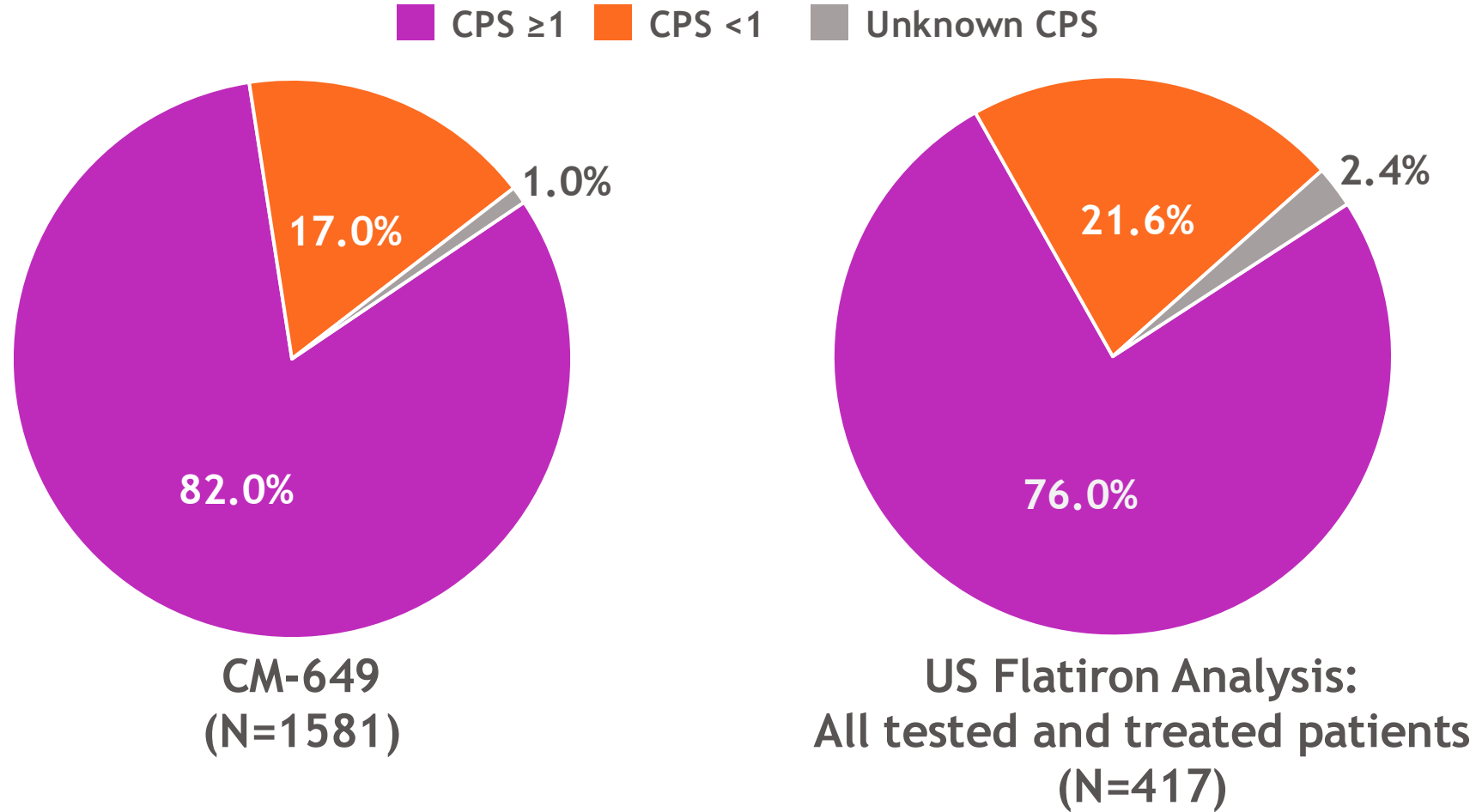
## Gastric, GEJ, and Esophageal Adenocarcinoma



Testing patterns among patients diagnosed with advanced/metastatic GC/GEJC/EAC from January 2023 to March 2024 using the Flatiron database. PubD 00065829. Princeton, NJ: Bristol-Myers Squibb Company; 2024.

# PD-L1 Expression by CPS

## Gastric, GEJ, and Esophageal Adenocarcinoma



US Flatiron Analysis: PD-L1 CPS Expression among patients diagnosed with advanced/metastatic GC/GEJC/EAC from January 2023 to March 2024. PubD 00065829. Princeton, NJ: Bristol-Myers Squibb Company; 2024.

# Pre-analytic Variables Can Affect Results

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## Type of tissue sample

- Full thickness resection
- Biopsy

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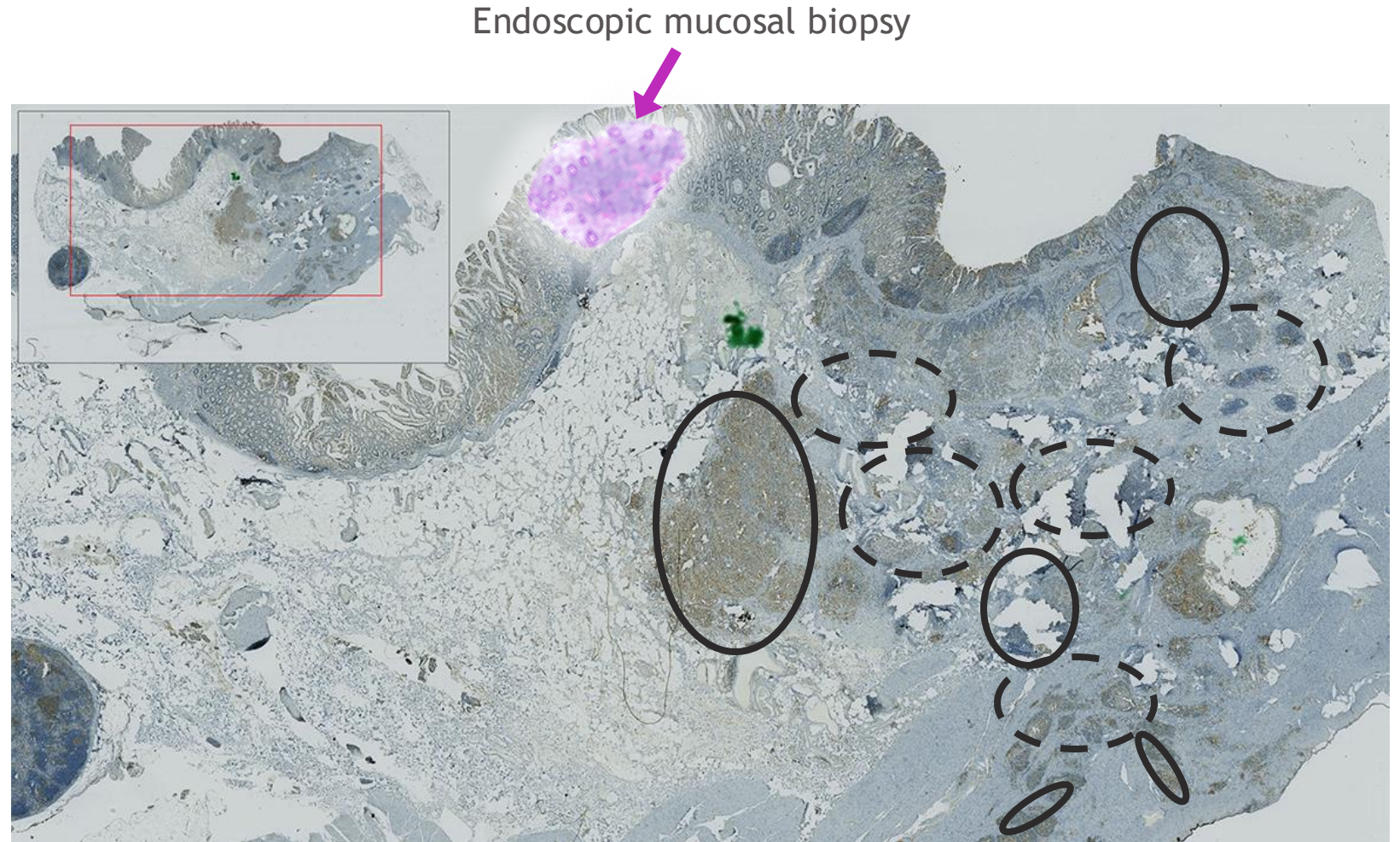
## Spatial heterogeneity of PD-L1 expression

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## Temporal heterogeneity

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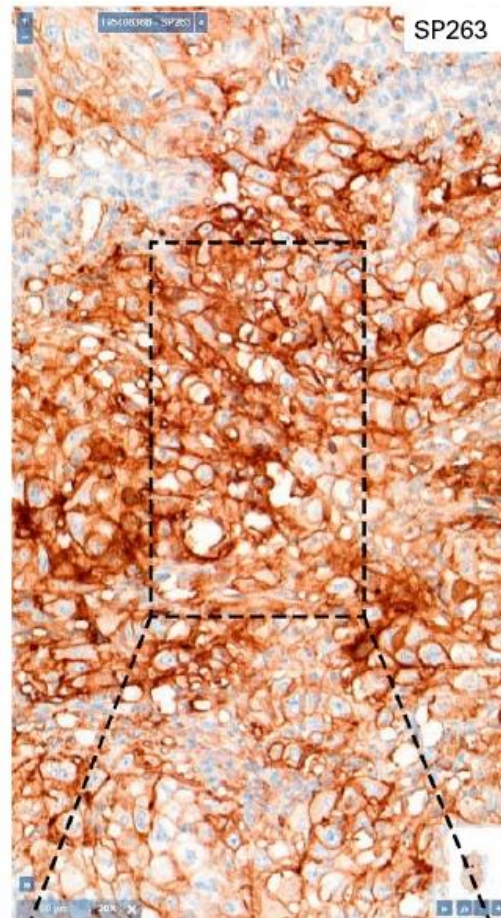
- Positive PD-L1 staining
- - - Negative PD-L1 staining



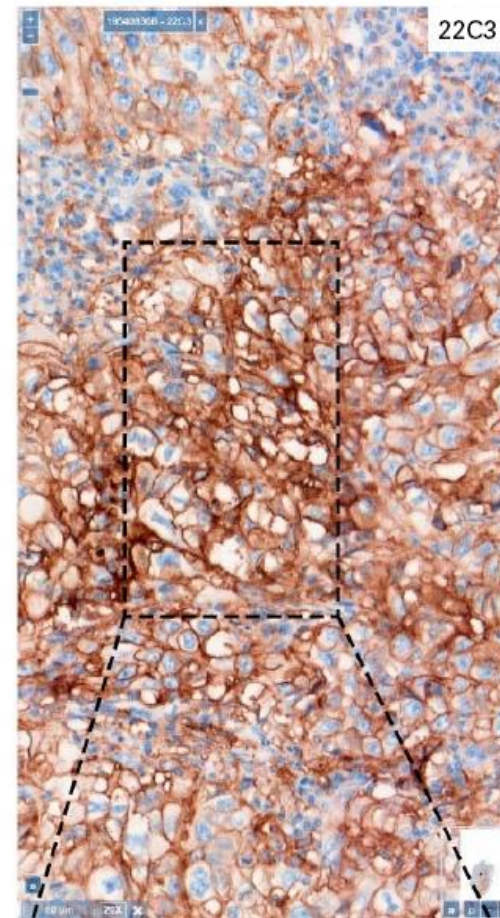
Courtesy of Dr. Robert Anders, The Johns Hopkins University, 2024.

# Analytic Variables Make Harmonization Challenging

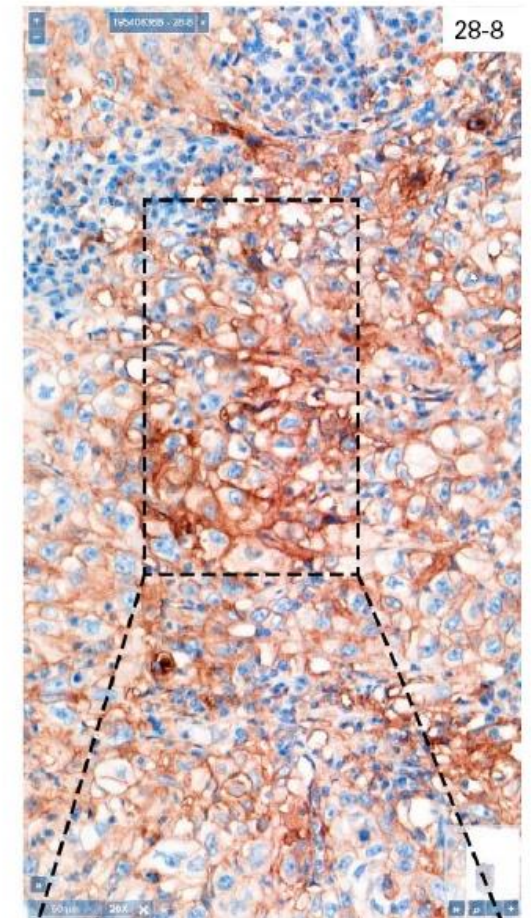
SP263



22C3



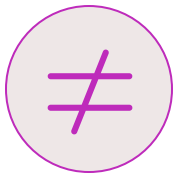
28-8



## Antibody performance



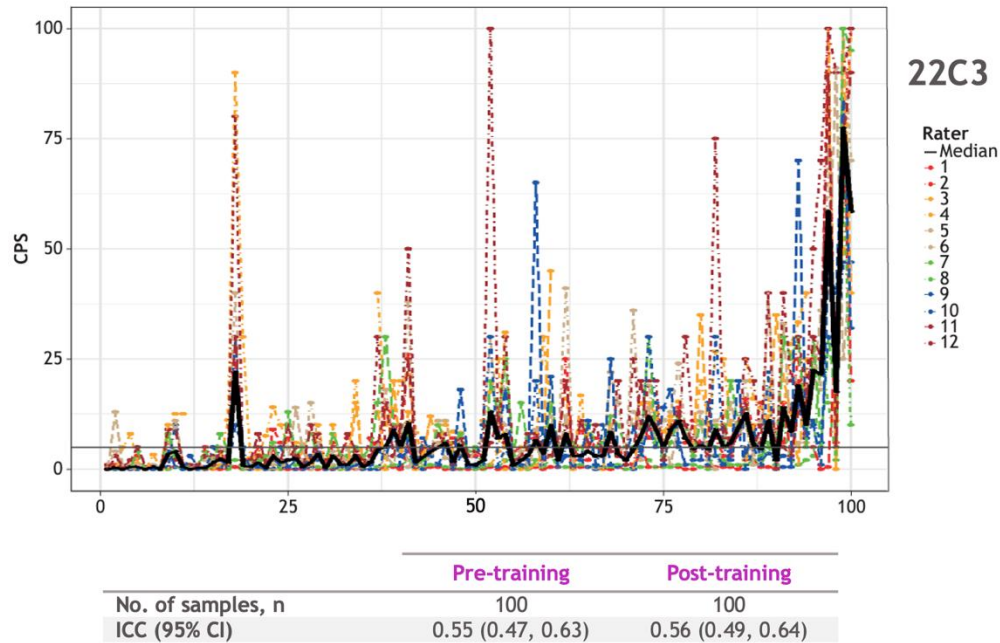
Similar



Not identical

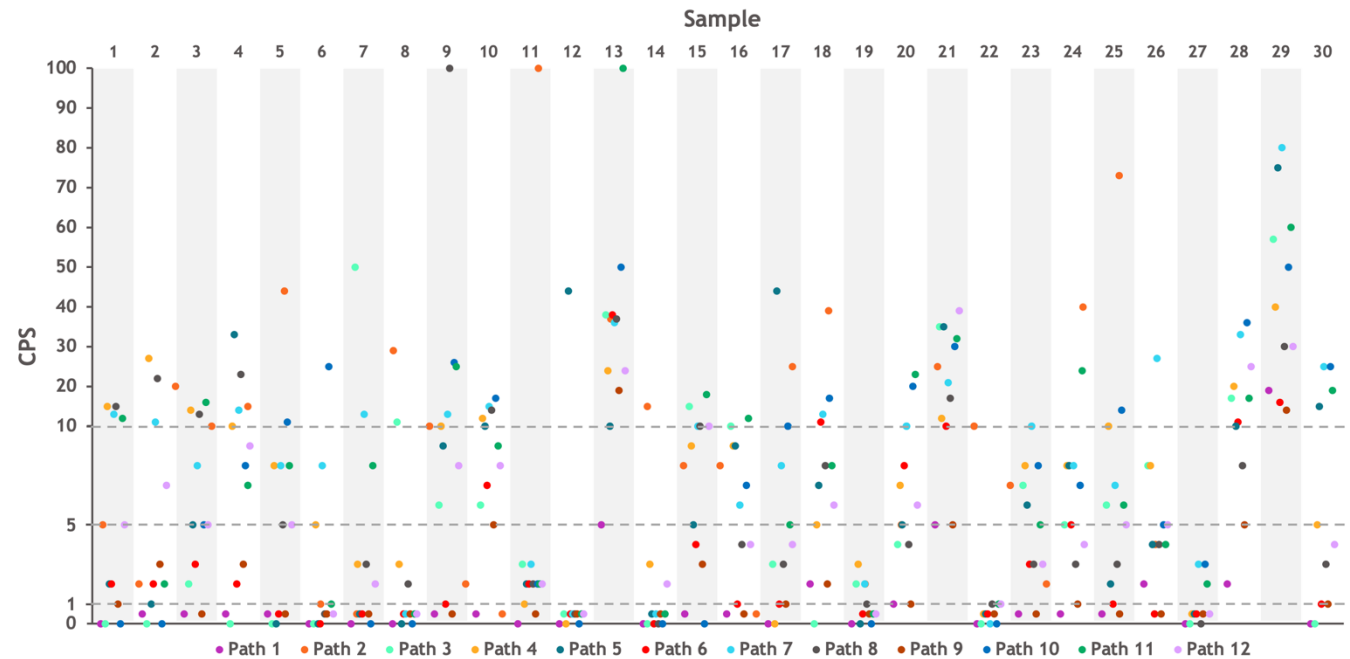
# High Interobserver Variability

High interobserver variability among pathologists evaluating PD-L1 expression by CPS on gastric cancer biopsies



## PD-L1 Expression Scoring

- Subjective
- Immune cells vs tumor cells
- Poor concordance irrespective of CPS cutoff



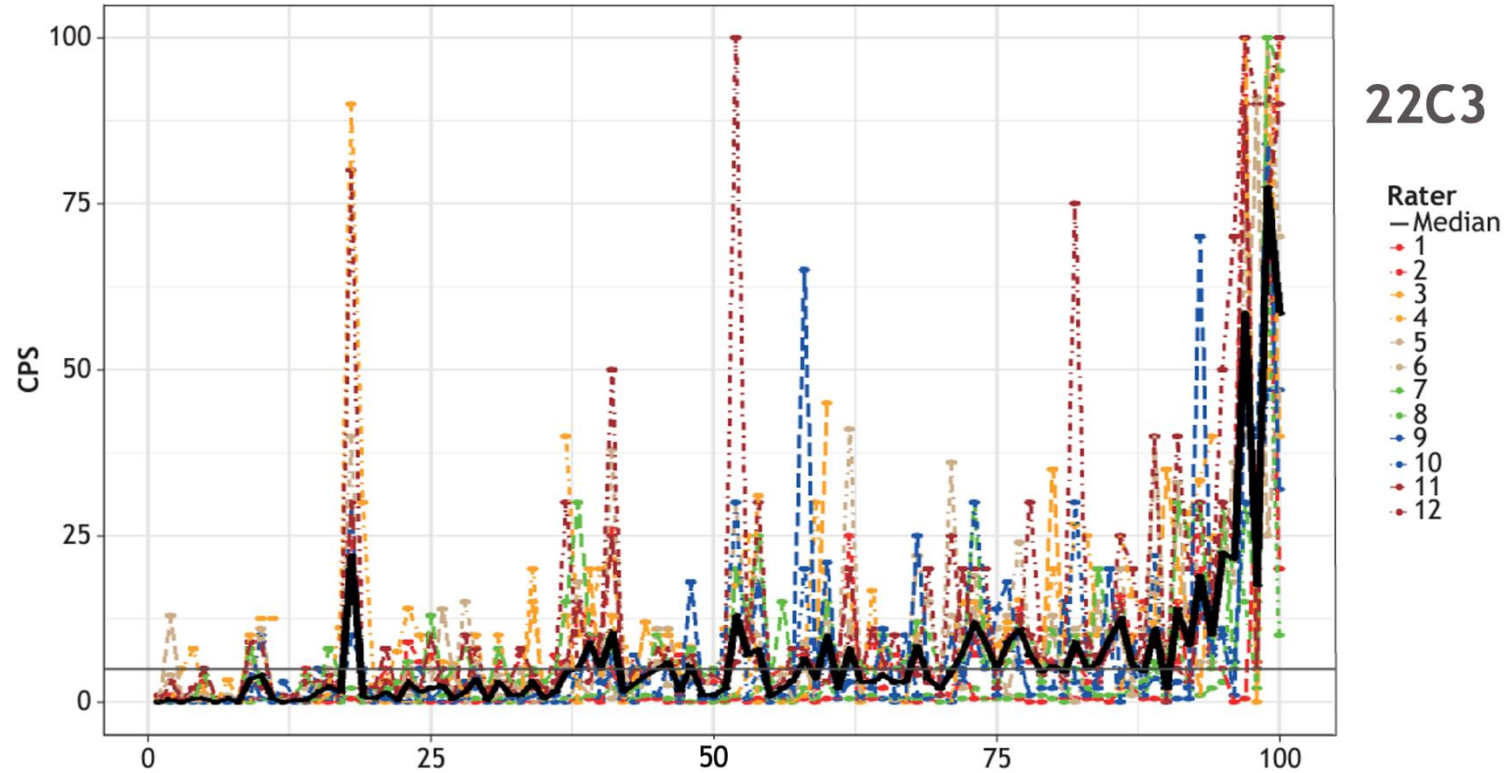
ICC, intraclass correlation coefficient. Robert ME, et al. *Mod Pathol*. 2023;36:100154. <https://creativecommons.org/licenses/by/4.0/>.

Robert M, et al. Presented at the USCAP 112th Annual Meeting, March 11-16, 2023, New Orleans, LA, USA.

PubD 00066171. Princeton, NJ: Bristol-Myers Squibb Company; 2024.



# High Interobserver Variability



	Pre-training	Post-training
No. of samples, n	100	100
ICC (95% CI)	0.55 (0.47, 0.63)	0.56 (0.49, 0.64)

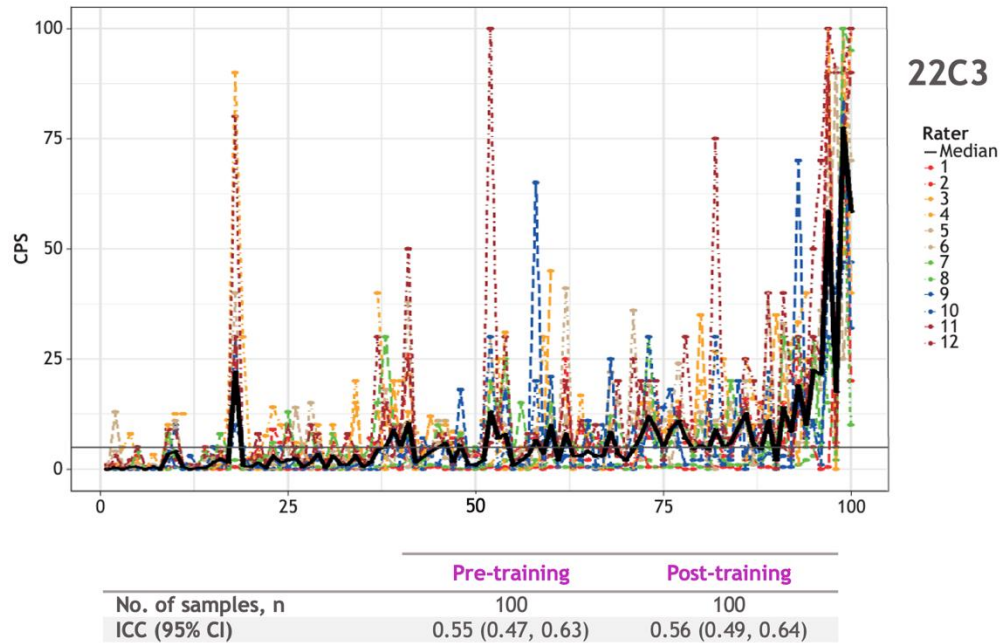
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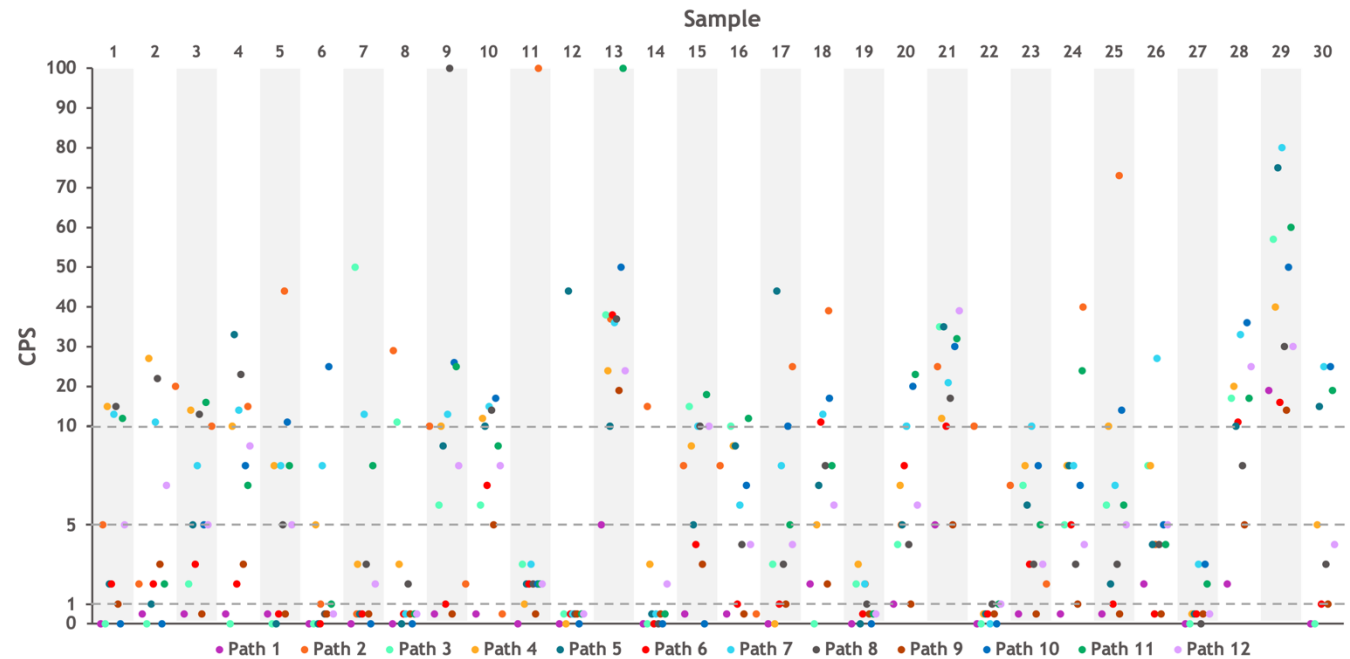
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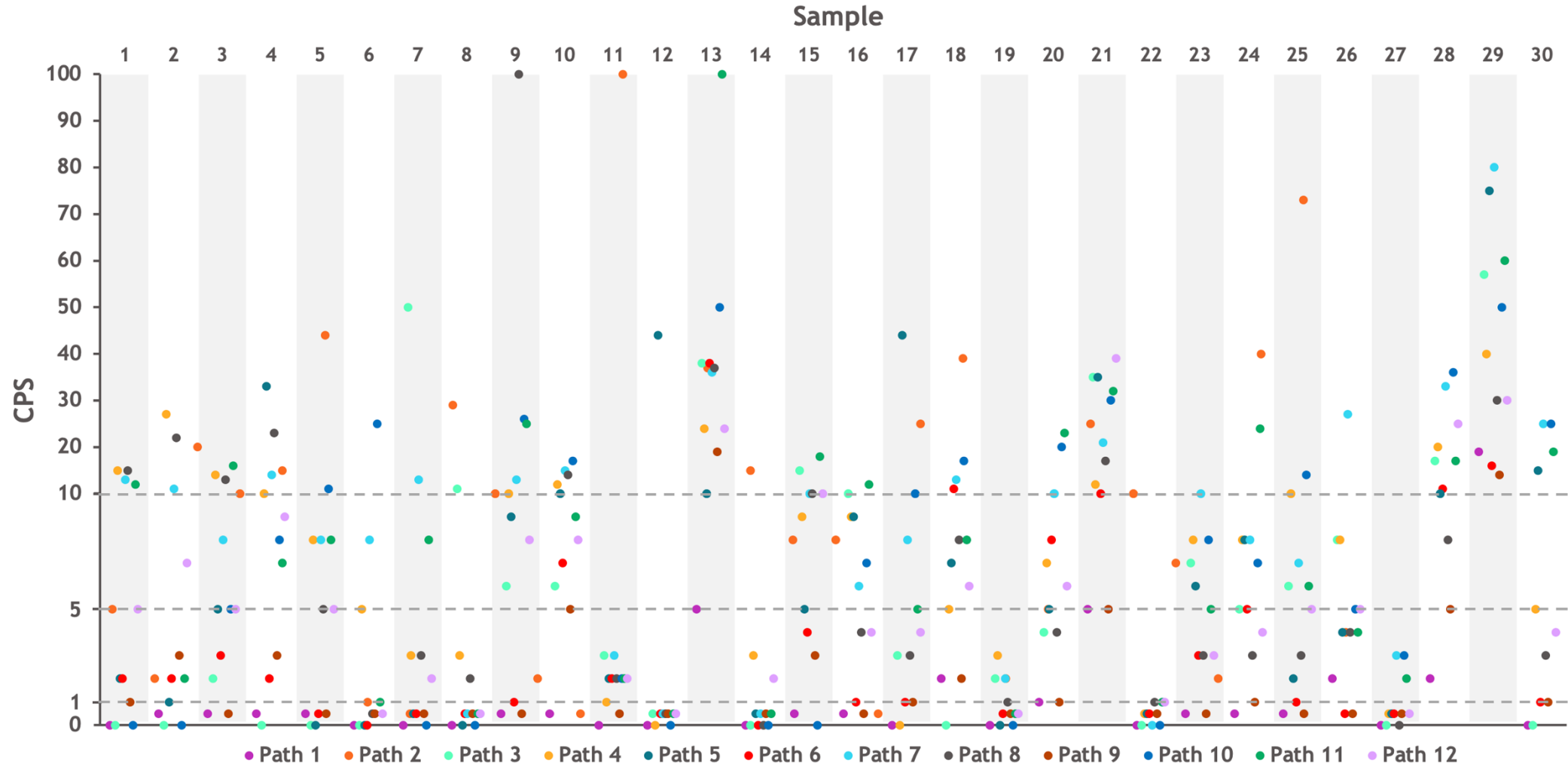


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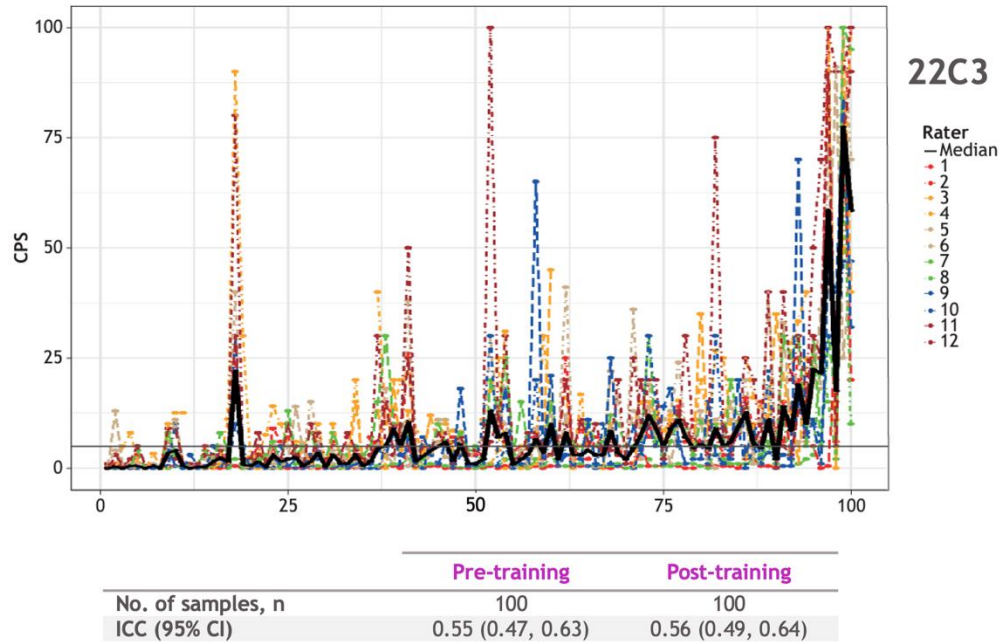
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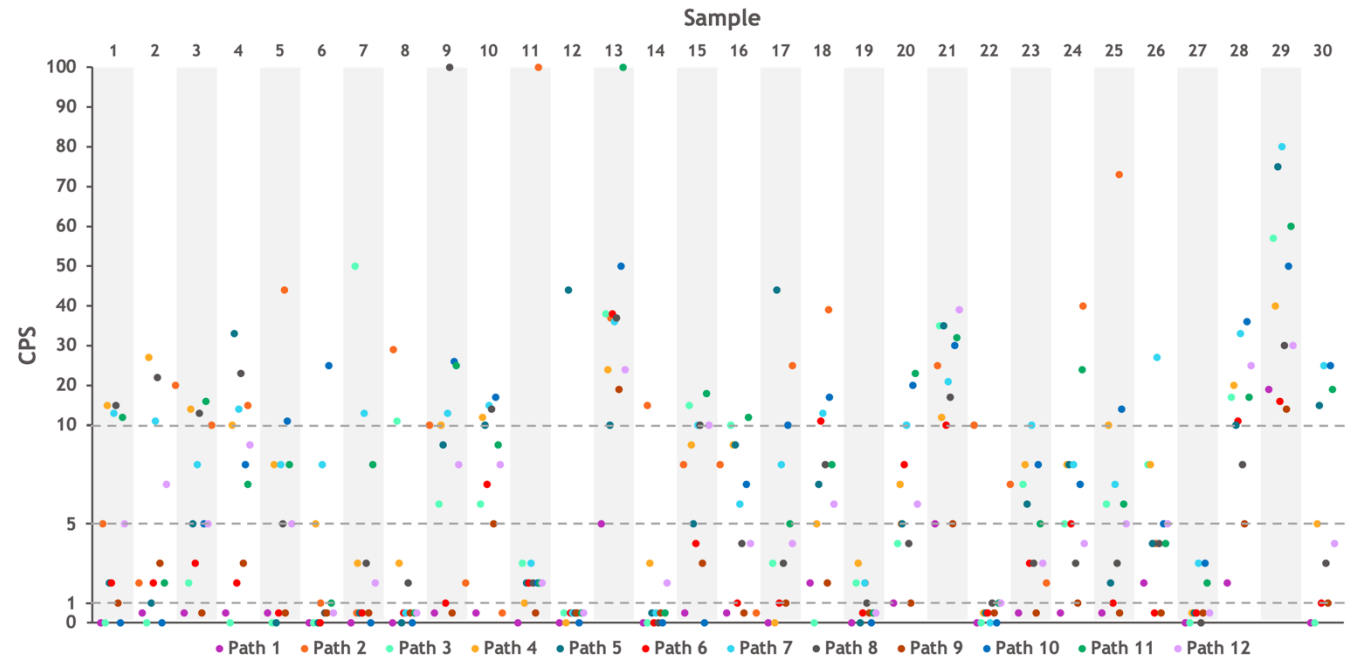
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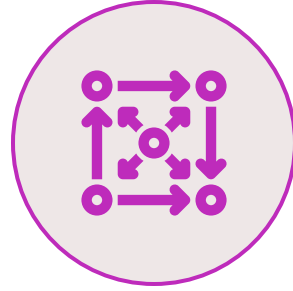
Robert M, et al. Presented at the USCAP 112th Annual Meeting, March 11-16, 2023, New Orleans, LA, USA.

PubD 00066171. Princeton, NJ: Bristol-Myers Squibb Company; 2024.

# Reality of PD-L1 Testing in Clinical Practice



**Heterogeneity  
of tumors**



**Dynamic  
biomarker**



**Different assays  
and antibodies**



**Interobserver  
variability**

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**Ian Waxman, MD**

Vice President,  
Late Development Oncology

**BMS**



# Conclusion

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# Summary of Trial Data and Testing Considerations

- Clinical trial data show OS benefit at CPS  $\geq 1$
- Multiple considerations impact the ability to measure PD-L1
  - PD-L1 is a dynamic biomarker
  - Tumor heterogeneity leads to variability in scores
  - Quality/adequacy of tissue may be a barrier to testing
- Despite these challenges, patients should be tested when possible, to best inform benefit risk
- If PD-L1 positivity is deemed necessary for treatment, a cut-off based on CPS  $\geq 1$  is the most reasonable choice based on the data from CheckMate 649 and testing considerations

# Multiple Solutions Warrant Consideration

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## Modify the indication based on CPS $\geq 1$

- Rational approach that would ensure only patients most likely to benefit receive treatment
- However, this would also leave some patients without a potentially important treatment option
  - Risk could be minimized by choosing a cut-off of CPS  $\geq 1$  rather than a higher cut-off

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## Keep current indication

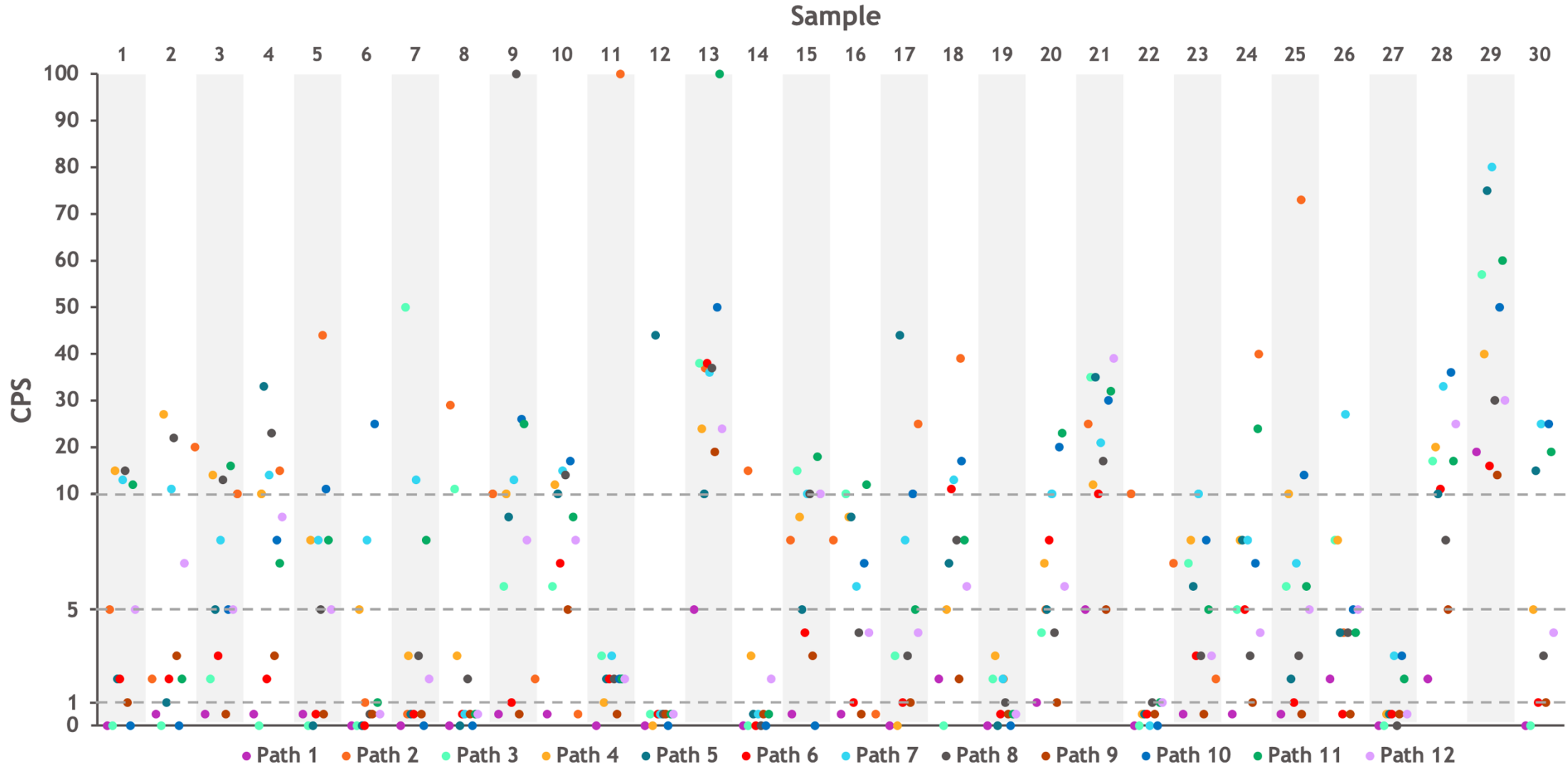
- Leaves decision-making in the hands of the treating physician and maximizes the chance for patients to benefit, given the shortcomings of available testing in gastric cancer



# Back Up Slides Shown

US Food & Drug Administration  
Oncologic Drugs Advisory Committee  
September 26, 2024

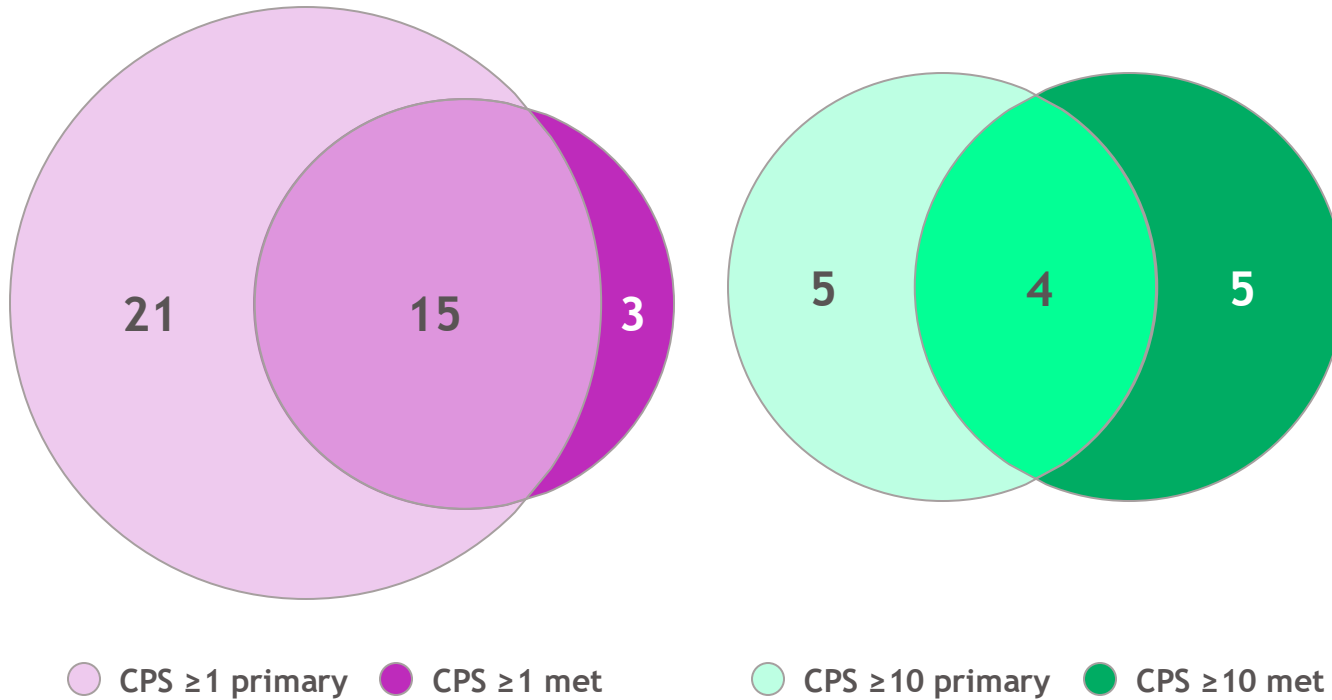
# High Interobserver Variability (Robert et al. *Mod Pathol.* 2023)



# PD-L1 Expression is Dynamic

Spatiotemporal Heterogeneity

Primary vs Metastatic  
61% intra-patient agreement



		Baseline met PD-L1		
		Negative	Positive	Total
Baseline 1° PD-L1	Negative	23 (88%)	3 (12%)	26
	Positive	21 (58%)	15 (42%)	36
	Total	44 (71%)	18 (29%)	62

$P = 2.4 \times 10^{-4}$  by McNemar test

		Baseline met PD-L1		
		CPS <10	CPS ≥10	Total
Baseline 1° PD-L1	CPS <10	48 (91%)	5 (9%)	53
	CPS ≥10	5 (56%)	4 (44%)	9
	Total	53 (85%)	9 (15%)	62

$P = 1$  by McNemar test

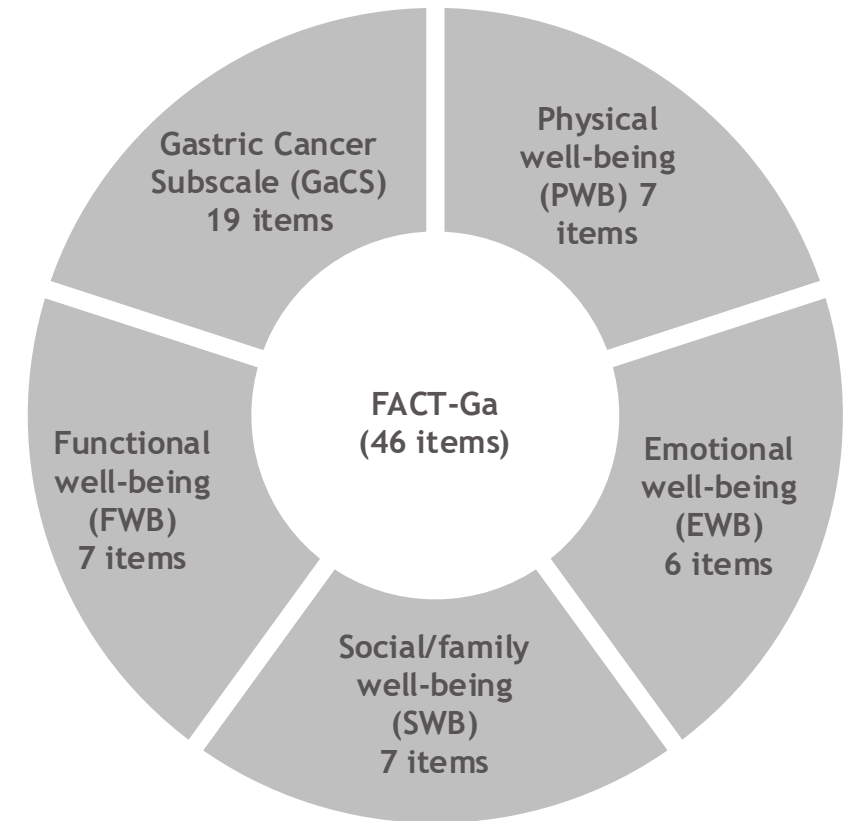
Gastroesophageal adenocarcinoma; Zhou KI, et al. *Clin Cancer Res.* 2020 Dec 15;26(24):6453-6463.

# Method - FACT-Ga

The Functional Assessment of Cancer Therapy - General (FACT-Ga) is a 46-item questionnaire designed to measure five domains of HRQOL in cancer patients: Physical, social/family, emotional, functional well-being and Gastric Cancer Subscale (GaCS)

Higher scores indicated better health/HRQoL

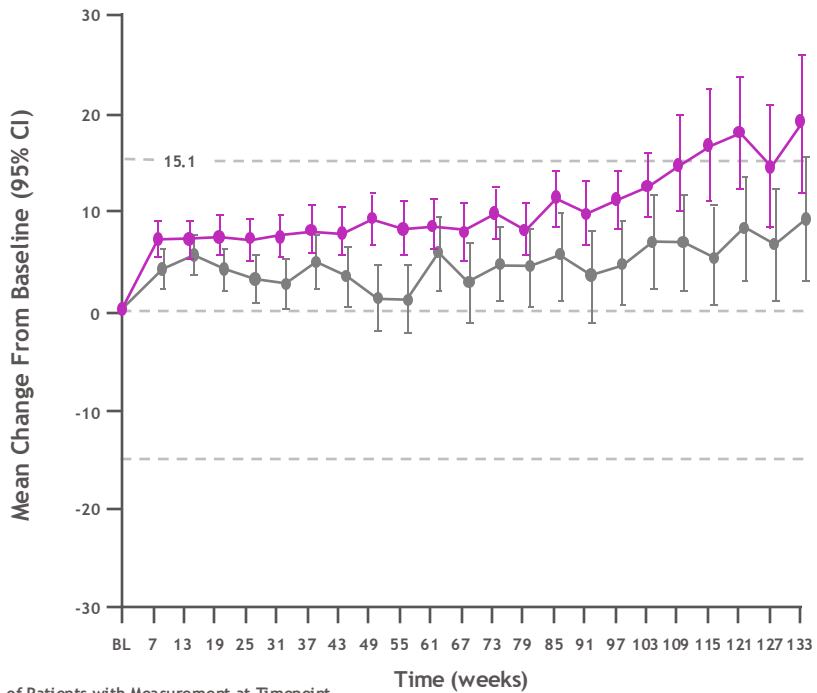
PRO measure	Range	Meaningful Change Threshold (MCT)
PWB subscale	0-28	3
SWB subscale	0-28	3
EWB subscale	0-24	3
FWB subscale	0-28	3
GaCS	0-76	8.2
FACT-Ga total score	0-184	15.1



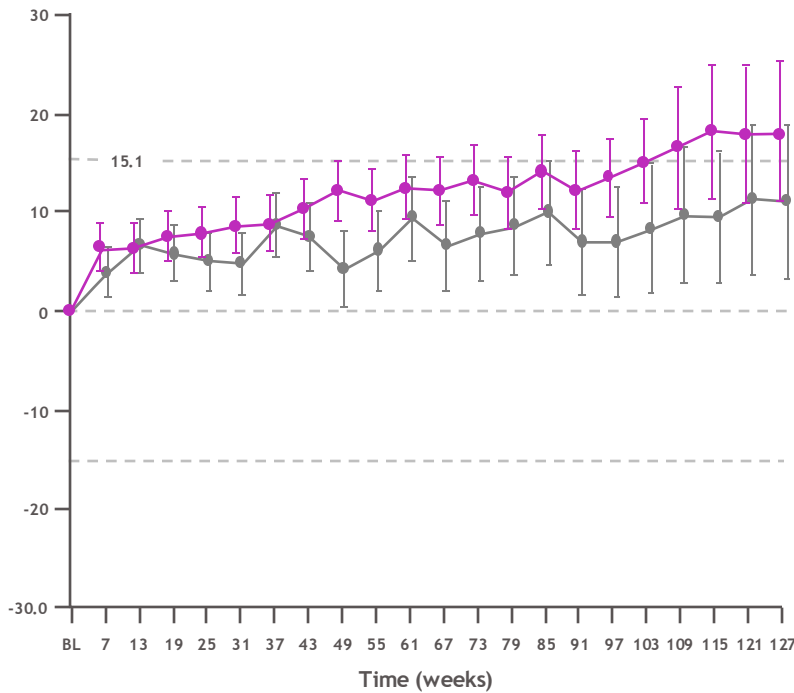
Cella D, et al. *Qual Life Res.* 2002 May;11(3):207-21.; Yost KJ, et al. *Value Health.* 2005 Mar-Apr;8(2):117-27.; Garland SN, et al. *Cancer.* 2011 Mar 15;117(6):1302-12.

# Mean Change in FACT-Ga from Baseline - Physical, Emotional, Social, Functional Well Being and Gastric Cancer Subscale (46 Questions)

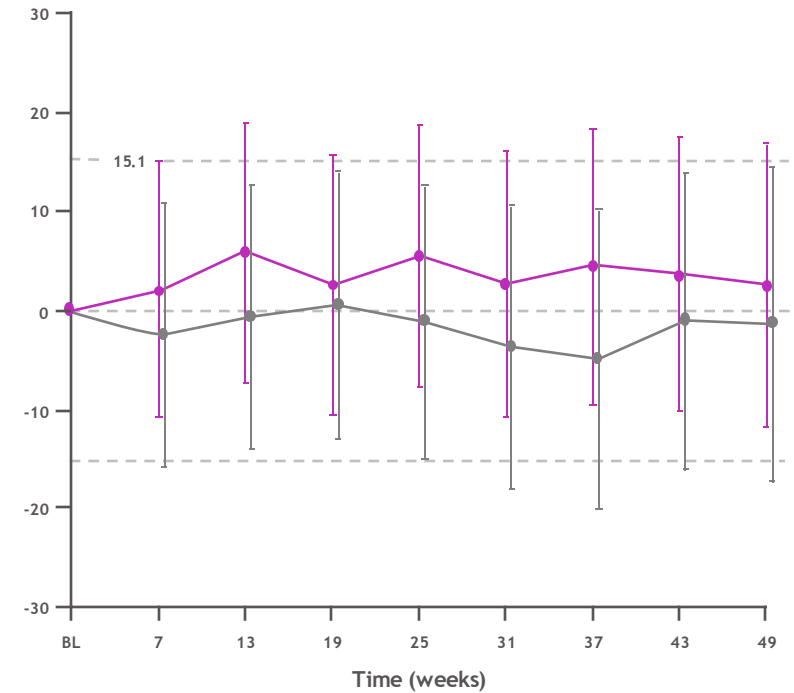
All Randomized



CPS ≥1



CPS <1



No. of Patients with Measurement at Timepoint

Nivo + chemo	679	604	518	456	378	320	272	218	189	167	150	129	113	98	86	78	72	63	24	20	17	15	11
Chemo	639	548	438	333	275	207	164	129	94	82	66	57	50	44	39	37	34	25	22	23	18	17	13

Nivo + chemo	591	497	430	373	318	261	225	181	159	138	128	111	98	86	79	70	68	58	22	18	16	14
Chemo	590	456	363	278	233	178	142	111	80	72	60	52	45	39	34	32	29	20	18	19	14	13

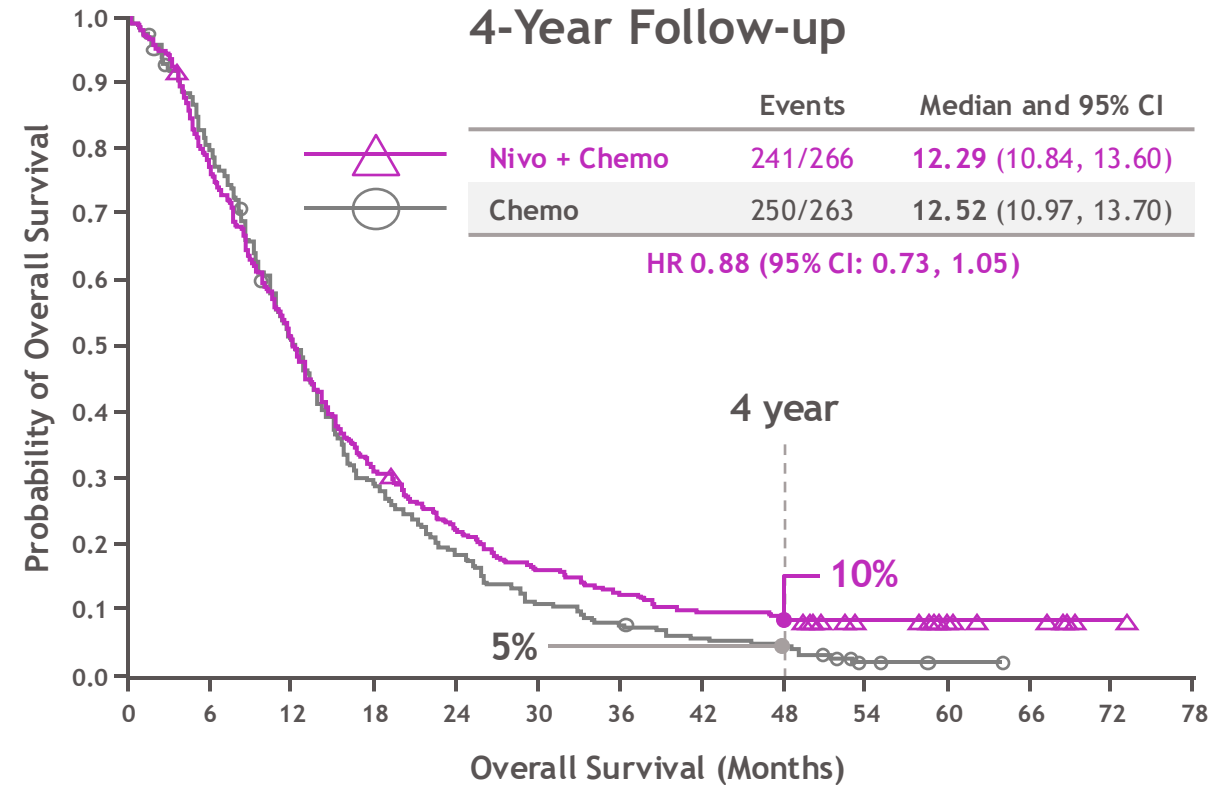
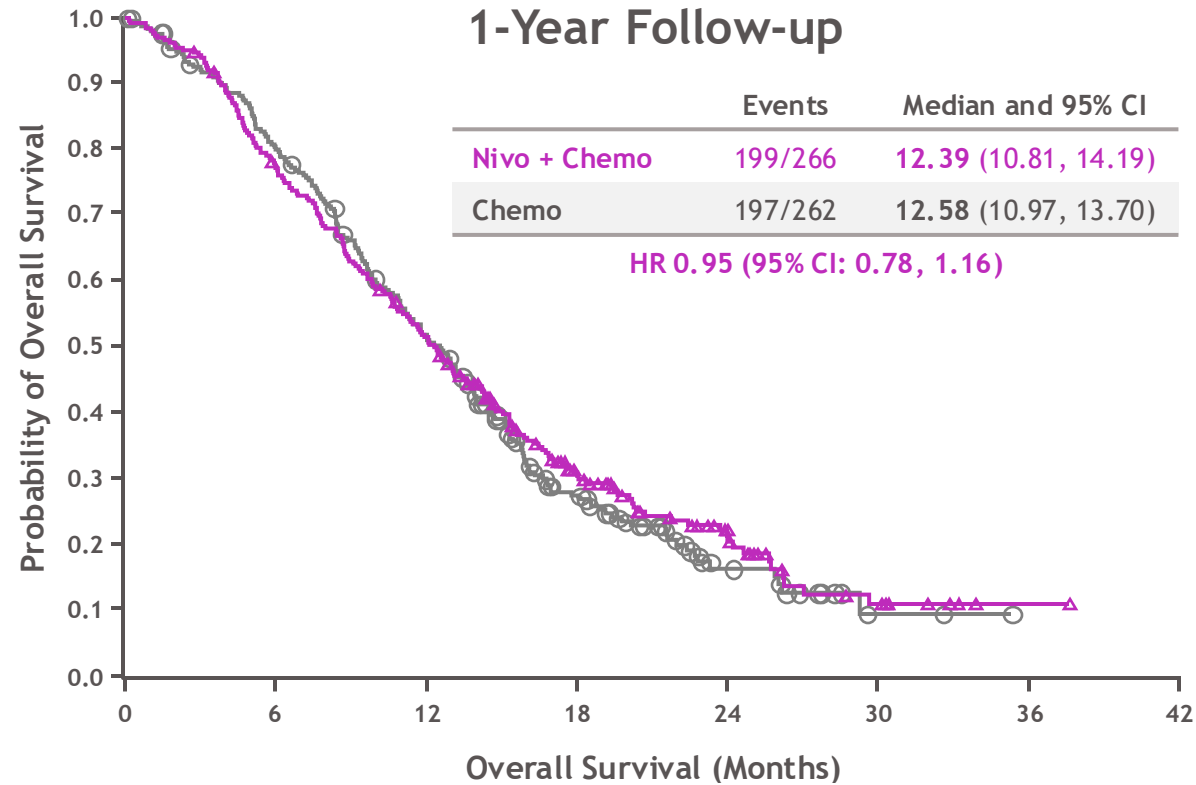
Nivo + chemo	130	101	83	77	56	56	44	33	28
Chemo	113	85	68	48	34	26	21	16	13

When there were less than 5 patients with assessments at a timepoint in either treatment arm, no further data was reported.

Moehler et al. J Clin Oncol 2023 41:5388-5399, BMS Data on File

# Overall Survival in CPS $\geq 1$ to $< 10$ Subgroup (Exploratory)

## CheckMate-649



Number of Subjects

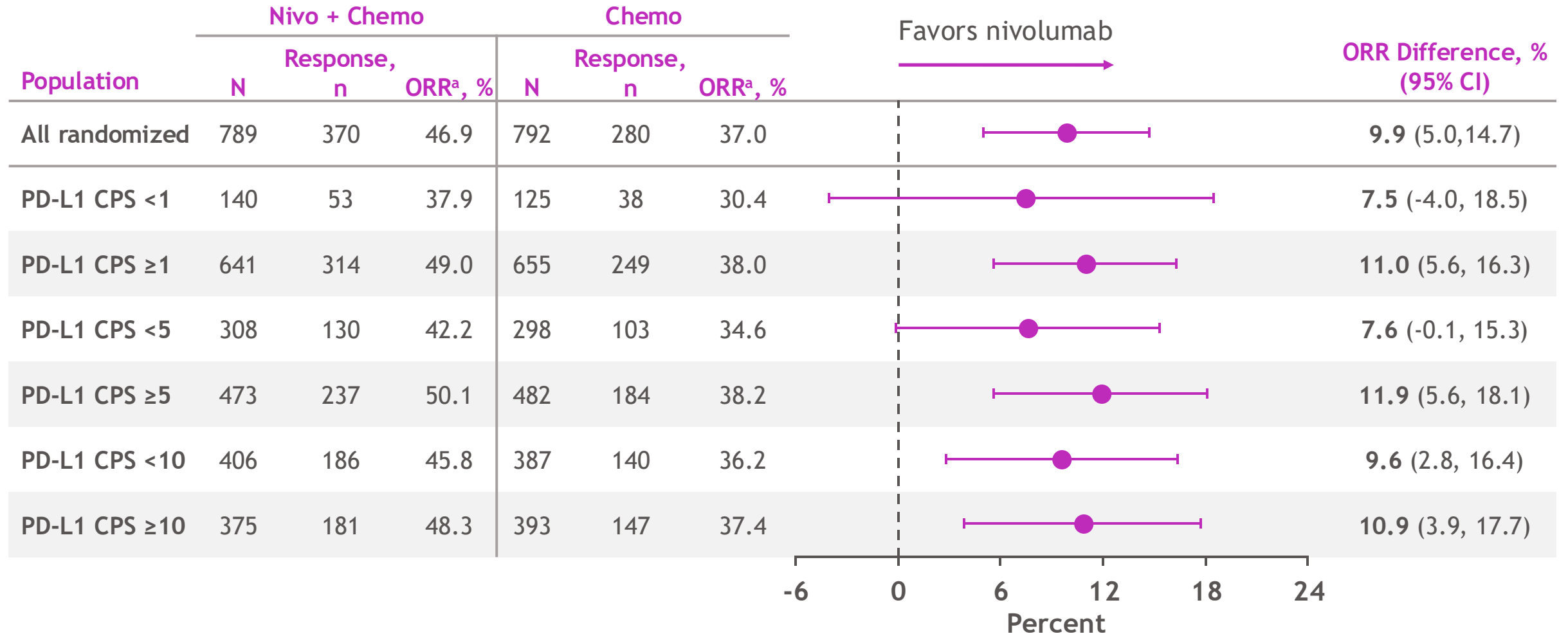
	0	6	12	18	24	30	36	42
Nivo + Chemo	266	203	134	58	23	7	1	0
Chemo	262	205	128	53	15	2	0	0

Number of Subjects

	0	6	12	18	24	30	36	42	48	54	60	66	72	78
Nivo + Chemo	266	205	136	84	59	43	34	26	25	16	11	5	1	0
Chemo	263	208	131	76	49	29	22	15	13	3	1	0	0	0

# Improvement in ORR Across PD-L1 Subgroups

CheckMate 649 All Randomized Patients

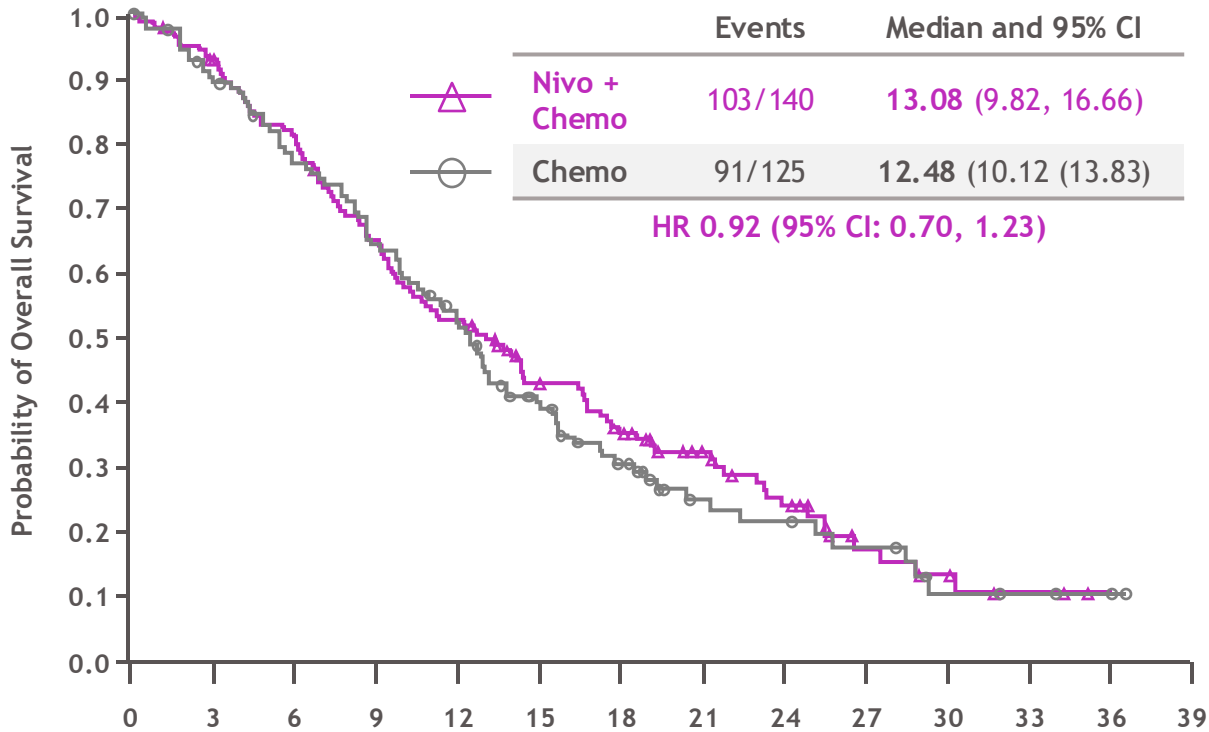


BMS Data on File

# Overall Survival in CPS <1 Subgroup (Exploratory)

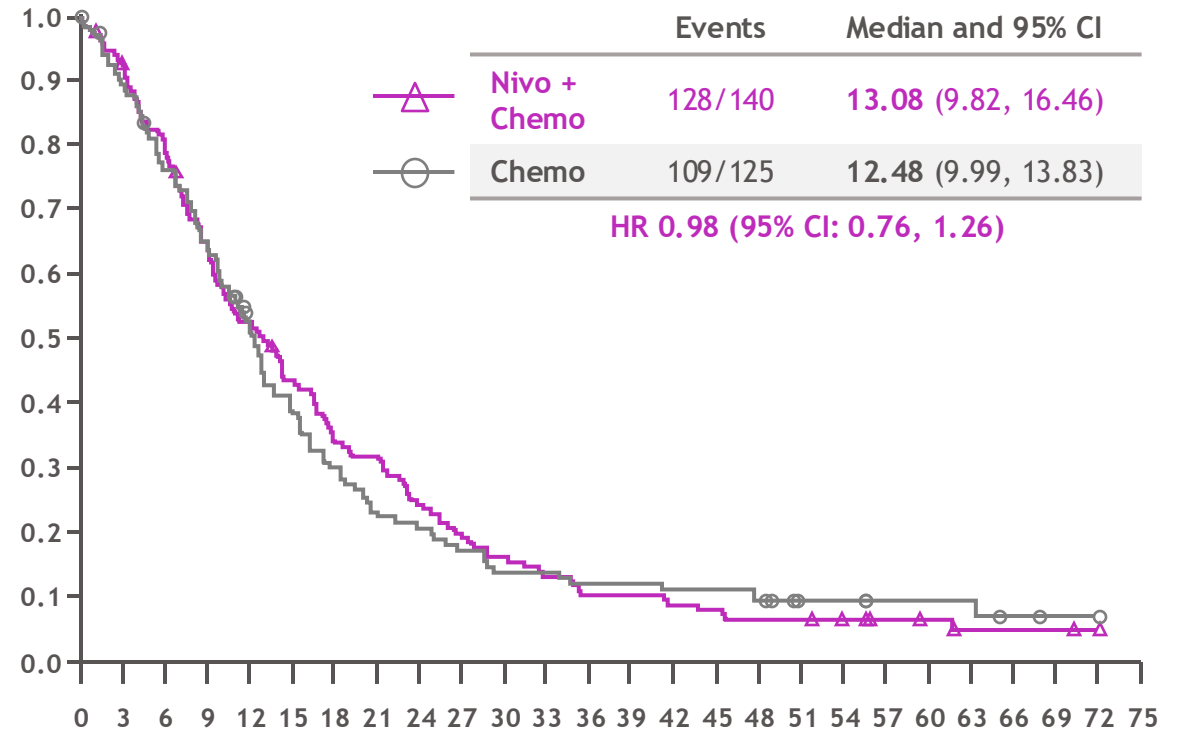
## CheckMate-649

### 1-year follow-up



Number of Subjects	Overall Survival (Months)													
Nivo + Chemo	140	129	112	89	72	51	40	29	20	9	6	3	1	0
Chemo	125	125	110	92	77	61	41	27	15	13	9	4	3	20

### 4-year follow-up



Number of Subjects	Overall Survival (Months)																									
Nivo + Chemo	140	129	112	89	72	59	47	43	33	27	22	18	14	14	12	11	9	9	7	5	4	2	2	2	1	0
Chemo	125	111	93	78	61	47	35	27	24	20	16	16	14	14	13	13	11	7	7	4	4	4	2	1	1	0

BMS Data on File