

Indigenous Student Computer Science Study Coalition

Analysis of Existing Code.org 2021-2022 Data

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Sponsored by Amazon Future Engineer

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Agenda

1. What is the Indigenous computer science (CS) study coalition?
2. What is the Code.org analysis and its role in the study coalition?
3. Code.org analysis findings
 - a. What does the state of Indigenous student access to CS look like in the US?
 - b. What does enrollment in foundational CS courses look like for Indigenous students in the US?
 - c. What do Advanced Placement (AP) CS course exam enrollment and passing rates look like for Indigenous students in the US?
4. Considerations and next steps

What is the Indigenous CS study coalition?

The Indigenous CS study coalition explores access to, and visions of, high-quality CS education centered on and for Indigenous students (*in middle and high school*) and tribal communities.

The study aims to better understand (a) how Indigenous youth and tribal communities are defining CS; and (b) what opportunities and barriers exist for Indigenous youth in pursuing computing-adjacent careers. The study coalition hopes the results from this study will start to improve CS educational pathways for Indigenous youth and tribal communities.



What is the Indigenous CS study coalition?

This study is being performed by a coalition of organizations that have assets, strengths, and capabilities at the intersections of Indigenous communities, computer science education, Western-based education research and evaluation methods, and Indigenous research and evaluation methods.



AIR®



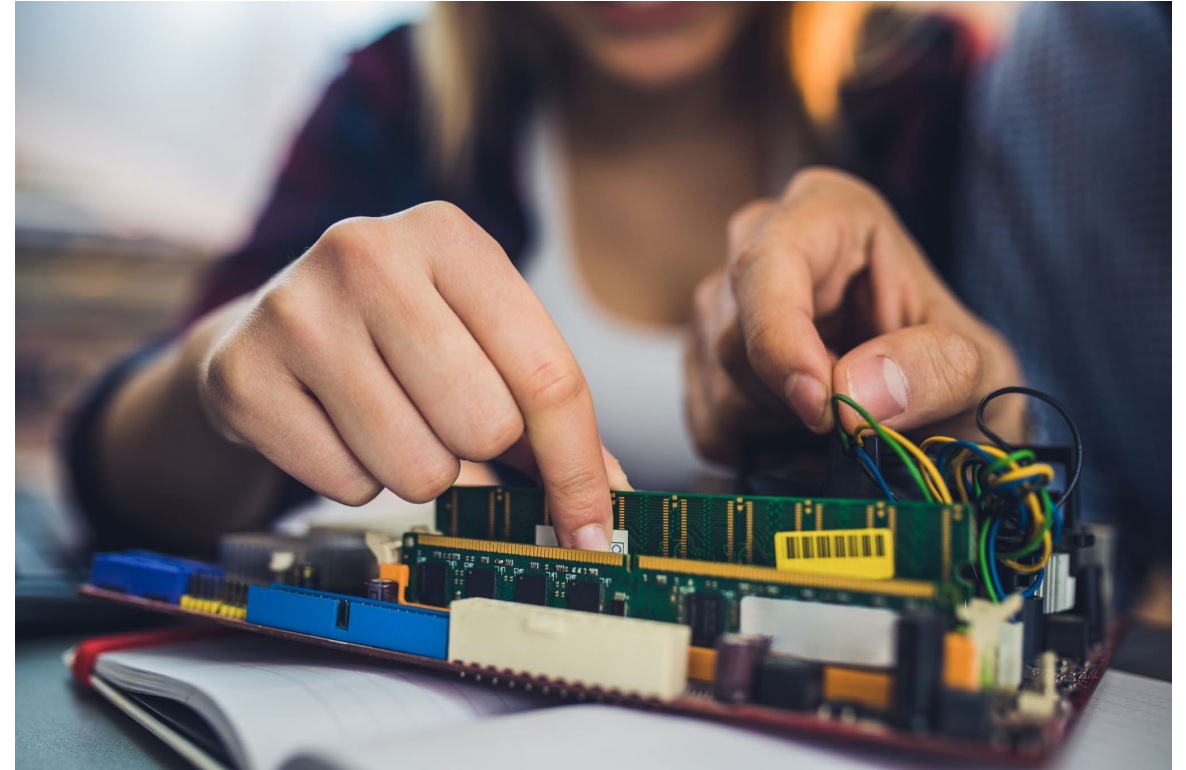
The Indigenous CS study coalition is guided by collectively defined core values

Centering relationships	Alignment of intent
Honor sovereignty	Service to community
Process over transaction	Co-creation
Hold ourselves accountable	Reciprocity
Emergent and organic	



What are the goals of the Indigenous CS study coalition?

- To understand the forms of computer science education opportunities Indigenous students have access to across grade levels.
- To explore Indigenous students' interests in learning computer science.
- To explore how CS education and Indigenous communities intersect.



How will the coalition conduct the study?

There are **five key activities** that are a part of the scope of this study:

- Literature Scan
- Analysis of Code.org K–12 Computer Science Access Data
- Wise Practices Review Using Talk Stories
- Community-Based Research Using Talk Stories
- Pilot Study and Proposal for Future Broader Study



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What is the Code.org analysis?

What is the Code.org analysis?

- Code.org annually collects computer science access data for K–12 students across the United States and summarizes the findings in a State of Computer Science [Annual Report](#).
- AIR conducted an analysis, using descriptive statistics, of extant Code.org datasets from 2021 and 2022 that were used to produce the annual access reports for these years—with a specific focus on the state of CS education access for Indigenous youth.

2022 State of Computer Science Education

UNDERSTANDING OUR NATIONAL IMPERATIVE

Why use Code.org CS access data?

Code.org offers insights into Indigenous student interest and access to CS through its data from 2021 and 2022. The following questions were asked using the data:

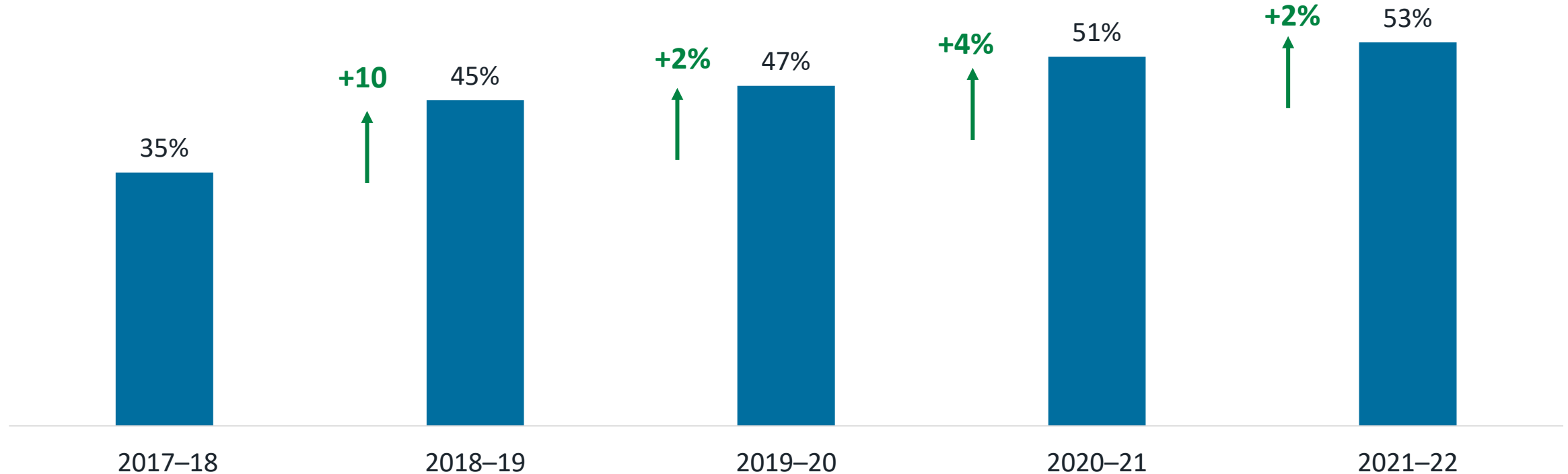
1. What does the state of Indigenous student access to CS courses look like in the US?
2. What does enrollment in foundational CS courses look like for Indigenous students in the US?
3. What do AP CS course exam enrollment and passing rates look like for Indigenous students in the US?
4. What are known limitations and challenges of these existing data?

How did we approach this extant data analysis?

	Description
Who	Code.org utilizes high school data collected using the National Center for Educational Statistics (NCES) list of schools that enroll students in at least one high school grade (9–12). Some states provided data on K–8 offerings and enrollment, and access and participation data. Demographic variables (including race/ethnicity) were from state education agency data.
What	Data elements of focus included: • Access to foundational CS courses • Enrollment in foundational CS courses • Access to Advanced Placement CS courses • Enrollment in Advanced Placement CS courses
Why	To describe the state of access to computer science for Indigenous youth across the United States
When	Data downloaded from Code.org Annual Access Report for 2022 and 2021
How	Most data elements were obtained by Code.org through state education agency collaboration or online portal requests. Other data collection methods included direct contact with states and school course catalogs. More detailed information about data sources and data collection methodology can be found in the State of Computer Science Education Report , Appendix 2.

What does the state of Indigenous student access to CS courses look like in the US?

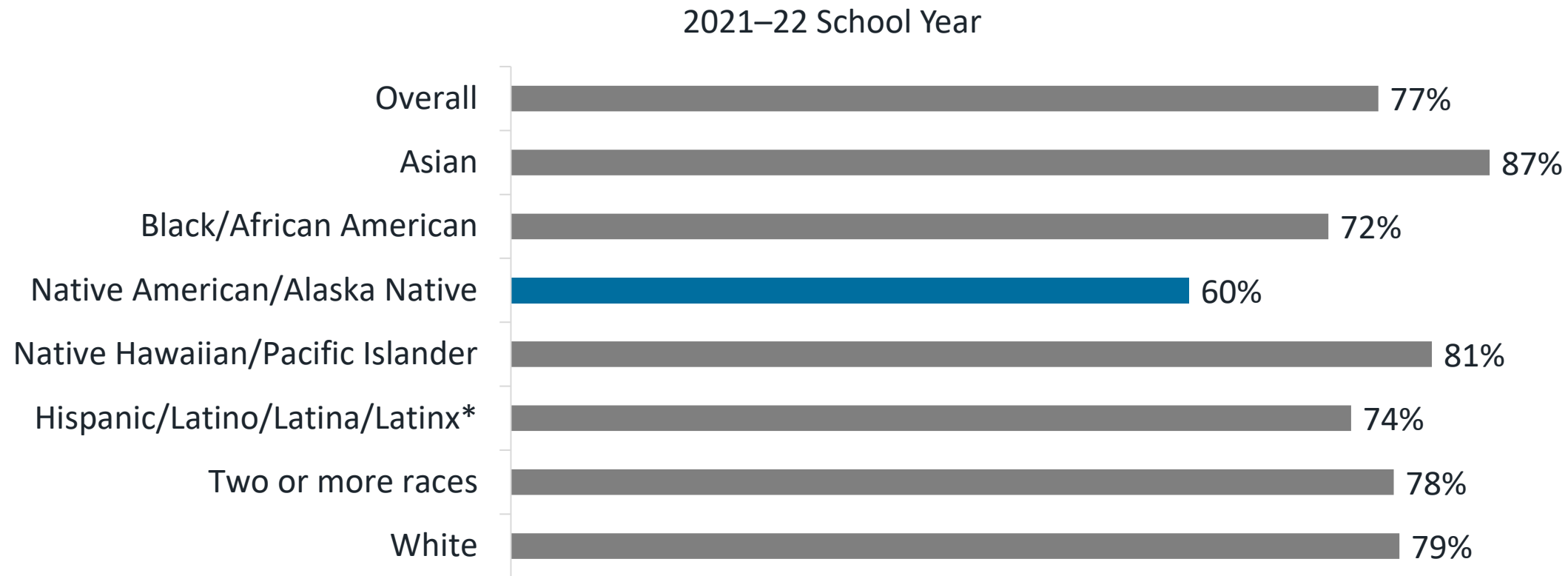
The number of US high schools offering CS nationally has increased since 2017



Data source. Retrieved from Code.org's 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

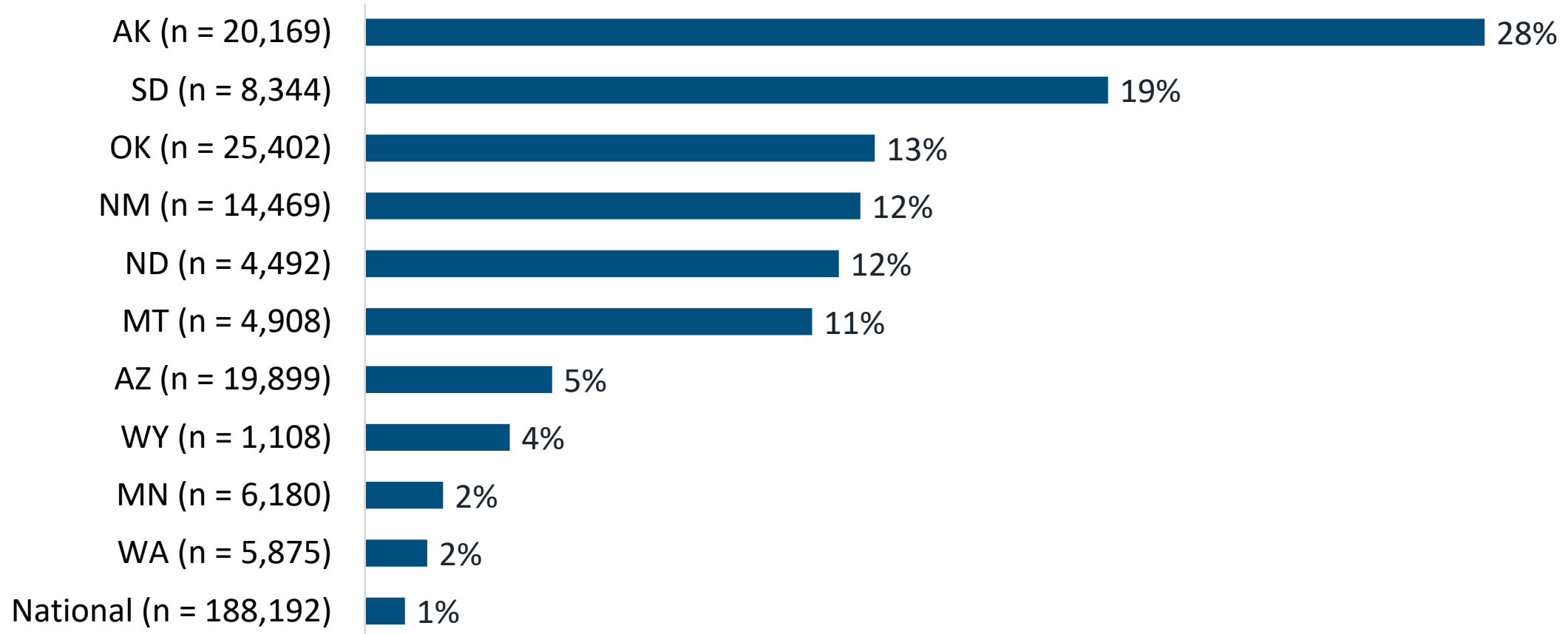
Note. Overall data for each report year are based on the most recent data from each state. 2017-18 data are from 24 states; 2018-19 data are based on 39 states.

Compared to their peers, Native American/Alaska Native (NA/AN) students attended high schools that *offered* CS at the lowest rates in both 2020–21 and 2021–22



Data source. Retrieved from Code.org’s 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>
* Some states and the NCES collect data and report on Hispanic/Latino/Latina students differently. Ethnicity and race may be asked simultaneously or in a two-part question. Students who select Hispanic and an additional race may be included in either the Hispanic counts or in the two or more races counts.

The 10 states with the highest percentages of NA/AN high school student populations of students ranged from 2% to 28% in 2021

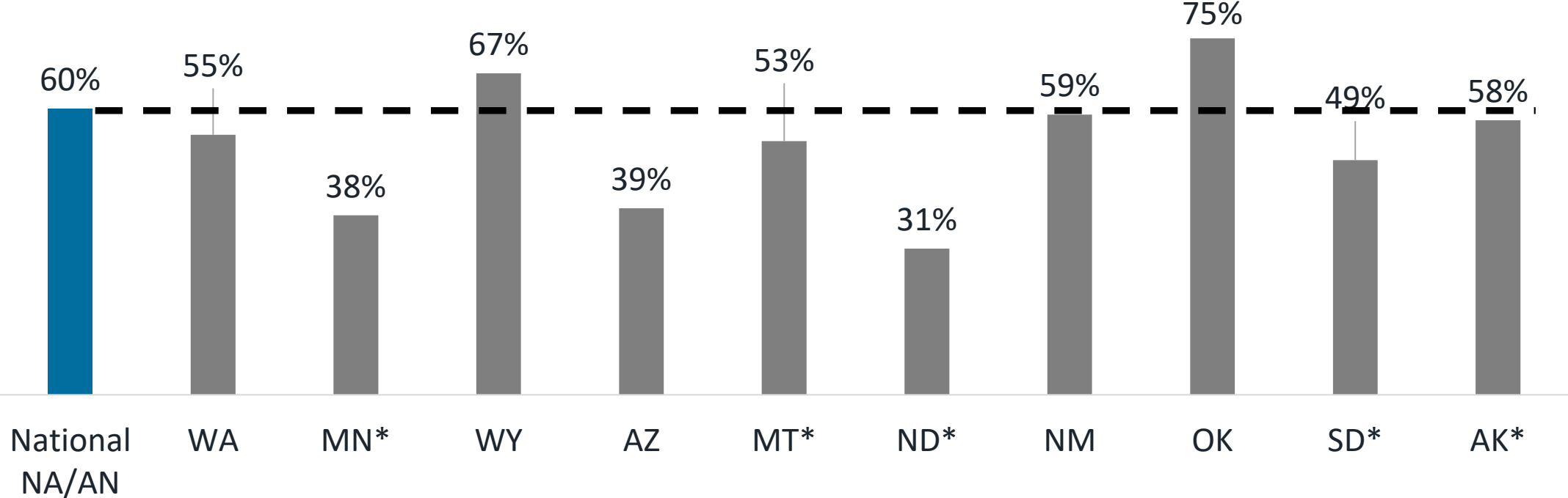


Data source. Retrieved from Code.org's 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

Note. n = number of students.

On average, 60% of NA/AN students nationally attended a high school that *offered* a foundational CS course in 2020–21

The top 10 states with Native American/Alaska Native high school students analyzed by students who attend a high school that offers foundational CS



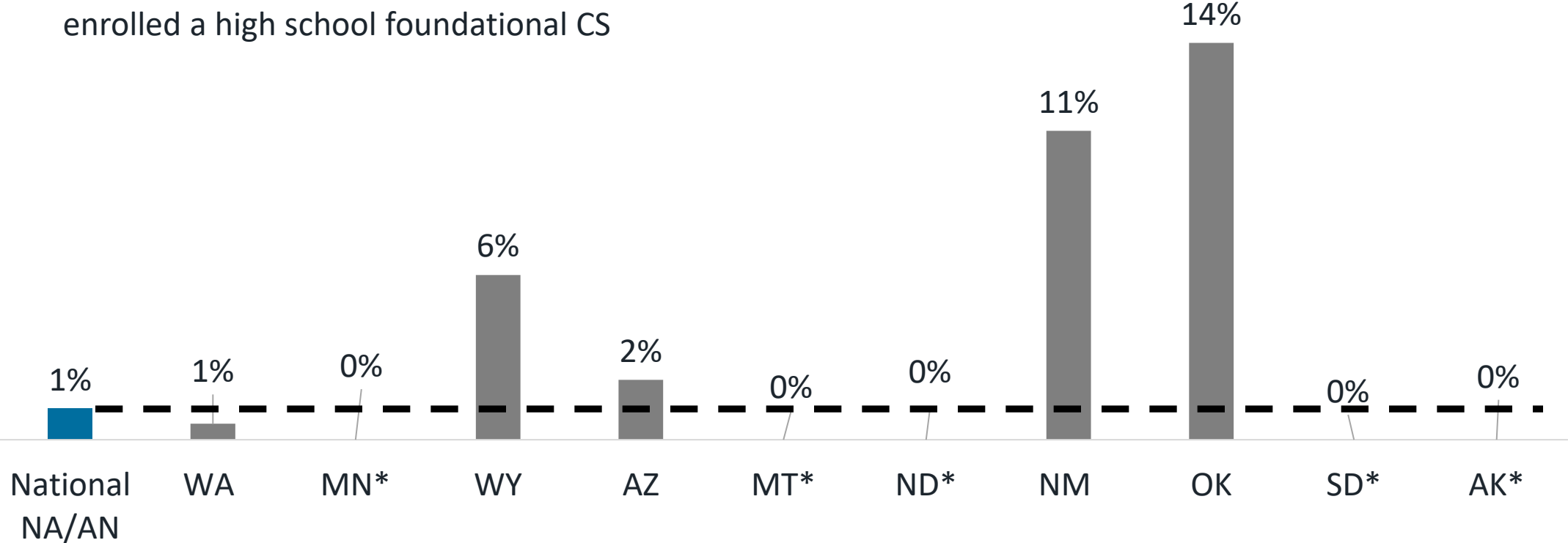
Data source. Retrieved from Code.org’s 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

Note. National n = 101,189; WA n = 3,202; MN n = 2,325; WY n = 747; AZ n = 7,775; MT n = 2,610; ND n = 1,377; NM n = 8,499; OK n = 18,979; SD n = 4,104; AK n = 3,283. n = number of students.

* MN, MT, ND, SD, and AK were not reported in Code.org’s 2022 State of CS Annual Access Report for the High School Computer Science Enrollment tab dataset.

Within the top 10 states with NA/AS high school students, 14% or fewer students actually *enrolled* in a high school foundational CS course in 2020–21

The top 10 states with Native American/Alaska Native high school students analyzed by students who enrolled a high school foundational CS



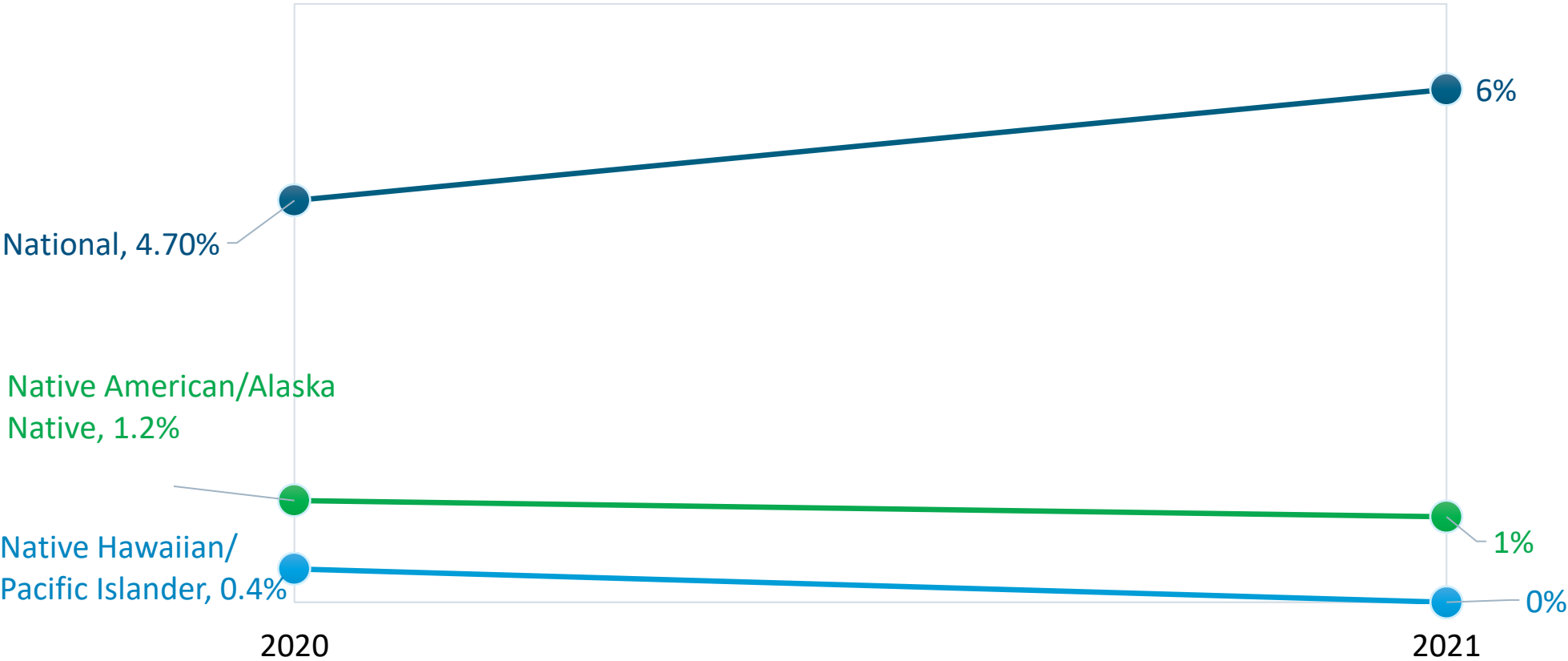
Data source. Retrieved from Code.org’s 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

Note. National n = 7,104; WA n = 86; MN n = data not reported; WY n = 66; AZ n = 74; MT n = data not reported; ND n = data not reported; NM n = 321; OK n = 1,294; SD n = data not reported; AK n = data not reported. n = number of students.

* MN, MT, ND, SD, and AK were not reported in Code.org’s 2022 State of CS Annual Access Report for the High School Computer Science Enrollment tab dataset.

What does enrollment in foundational CS courses look like for Indigenous students in the US?

NA/AN high school enrollment in foundational CS represents a smaller share of students in 2021 than 2020. This is partially due to the numbers telling a different story than the percentages.



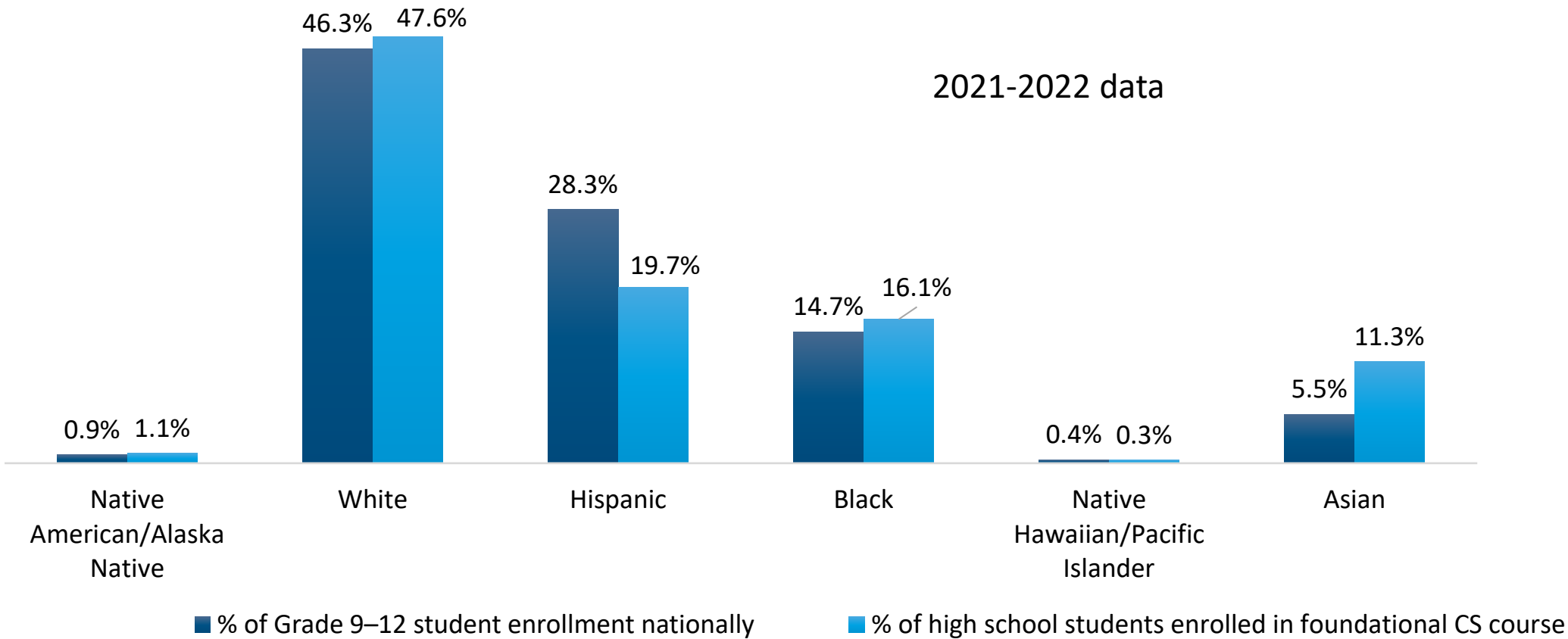
Data source. Retrieved from Code.org’s 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

More NA/AN high school students enrolled in CS foundational courses in 2021 compared to 2020. National enrollment, however, outpaced NA/AN growth.

CS Student Enrollment	2020	2021
National	538,809 +89,323 or 17% + ↑	626,132
Black/African American	88,742 (16%)	103,245 (16%)
Hispanic	105,941 (19%)	126,331 (20%)
Native American/Alaska Native	6,527 (1.2%) +577 or 9% + ↑	7,104 (1%)
Native Hawaiian/Pacific Islander	2,160 (.4%) -32 or 1.5% ↓	2,128 (.33%)
White	262,021 (48%)	305,868 (48%)
Asian	63,282 (12%)	72,806 (11%)

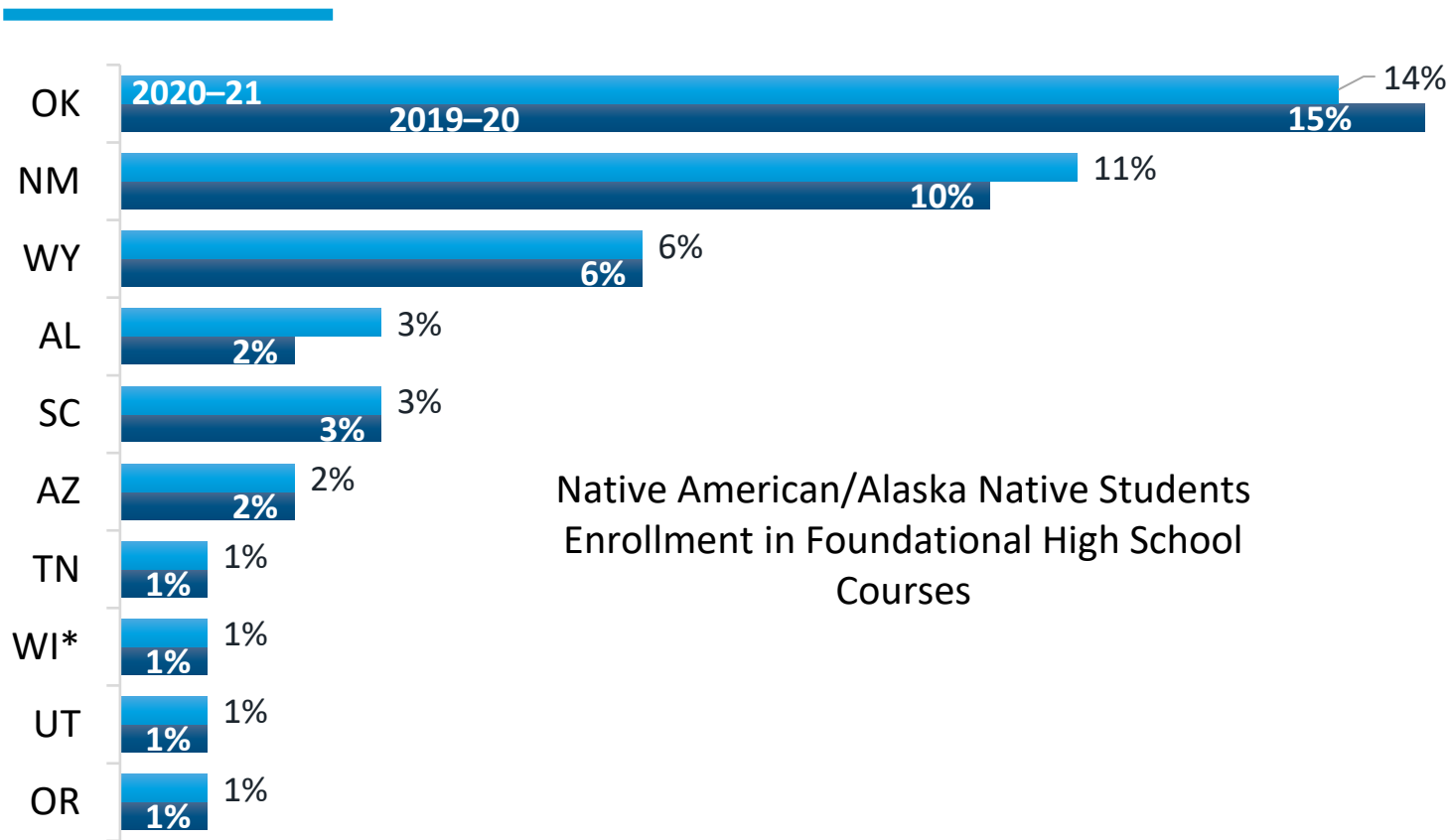
Data source. Retrieved from Code.org's 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

Nationally, enrollment in CS for NA/AN and Native Hawaiian and Pacific Islander (NH/PI) students aligned with their student enrollment proportions



Data source. Retrieved from [Code.org’s 2022 State of CS Annual Access Report](#) and [U.S. Department of Education, National Center for Education Statistics, Common Core of Data \(CCD\), "State Nonfiscal Survey of Public Elementary/Secondary Education," 1999-2000 through 2020-21 and 2021-22 Preliminary](#). (This table was prepared July 2022.)

The 10 states with the highest percentage of NA/AN high school students enrolled in foundational high school CS courses ranged from 1% to 14% in 2020–21



State	2020–21 Number of Students Enrolled in Foundational CS	2019–20 Number of Students Enrolled in Foundational CS
OK	1,294	2,048
NM	321	255
WY	66	119
AL	537	305
SC	2,674	1,818
AZ	74	191
TN	233	212
WI	162	162
UT	341	282
OR	163	60

Data source. Retrieved from Code.org’s 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

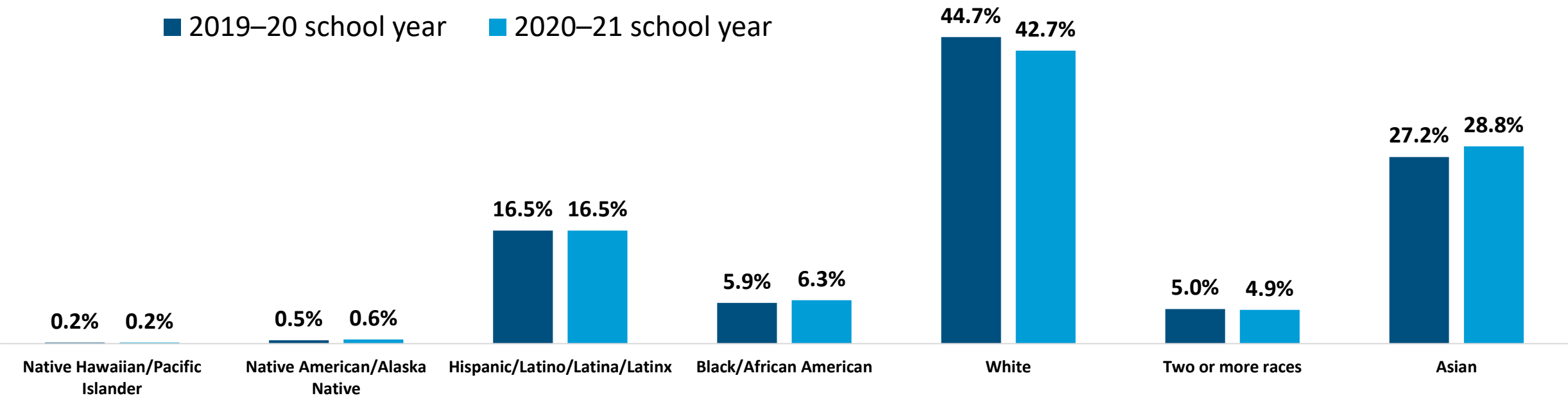
Note. Reporting year for enrollment data varies by state. The following states did not report enrollment data in the 2021 Code.org State of CS Annual Report: AK, CA, CO, ME, MI, MN, NC, NH, OH, PA, RI, SD, VT. The following states did not report enrollment data in the 2022 Code.org State of CS Annual Report: AK, CA, CO, IL, ME, MI, MN, MT, NC, NH, OH, PA, RI, SD

* For Wisconsin, rereporting 2020's year for enrollment data.

What do AP CS course exam enrollment and passing rates look like for Indigenous students in the US?

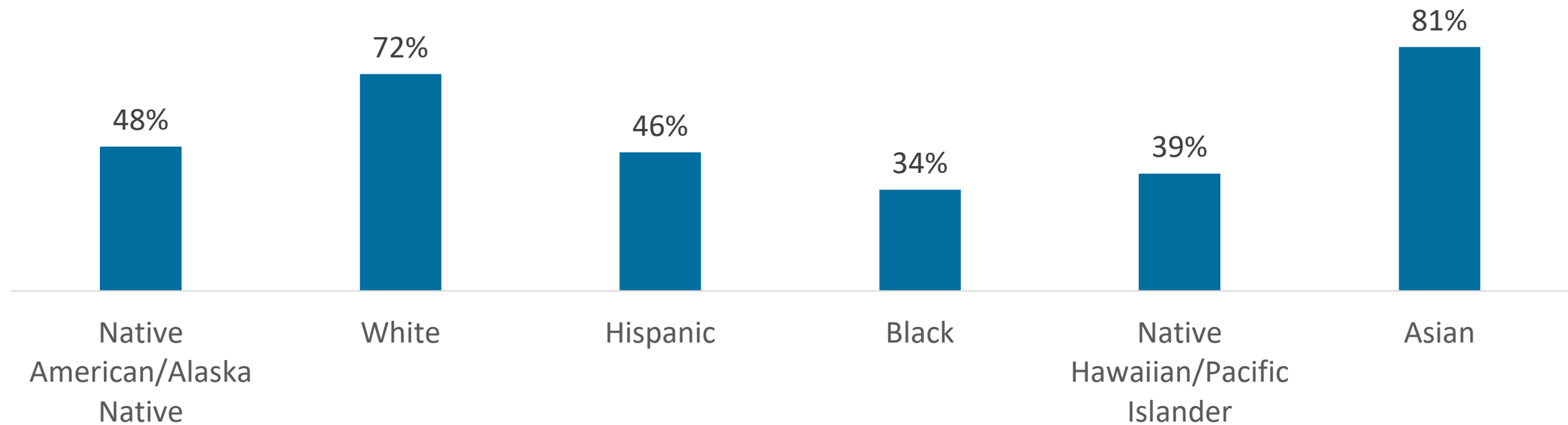
NA/AN and NH/PI students enroll in AP CS exams at the lowest rates compared to other racial/ethnic groups

Less than 1% of students enrolled in AP CS were NA/AN in 2020 and 2021



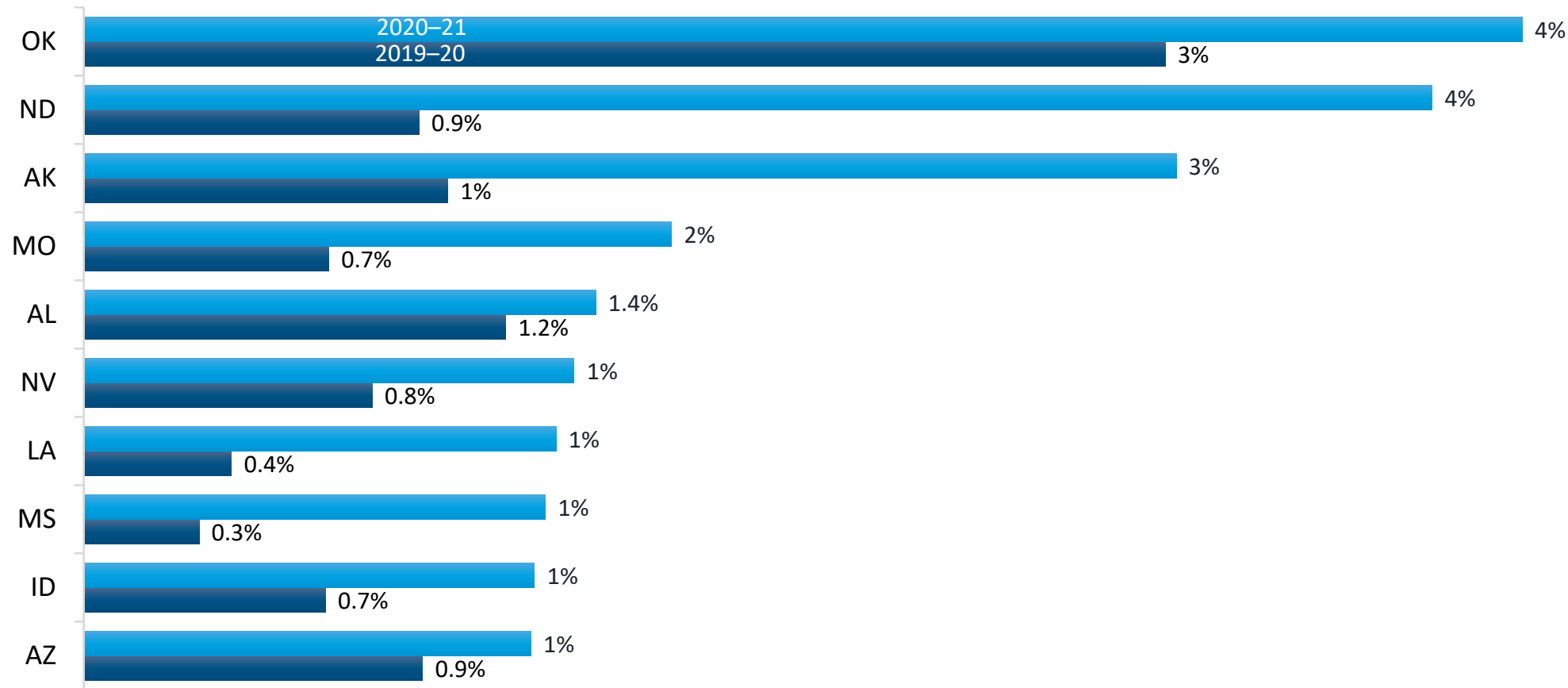
Data source. Retrieved from Code.org’s 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>
* Some states and the NCES collect data and report on Hispanic/Latino/Latina students differently. Ethnicity and race may be asked simultaneously or in a two-part question. Students who select Hispanic and an additional race may be included in either the Hispanic counts or in the two or more races counts.

NA/AN and NH/PI students pass the AP CS exams at the lowest rates compared to other racial/ethnic groups (48% and 39%)



Data source. Retrieved from CS4All AP CS Data for 2021. [Computing for Everyone](#)
Note. Dataset was collected directly from College Board and disaggregated by state, race, and gender.

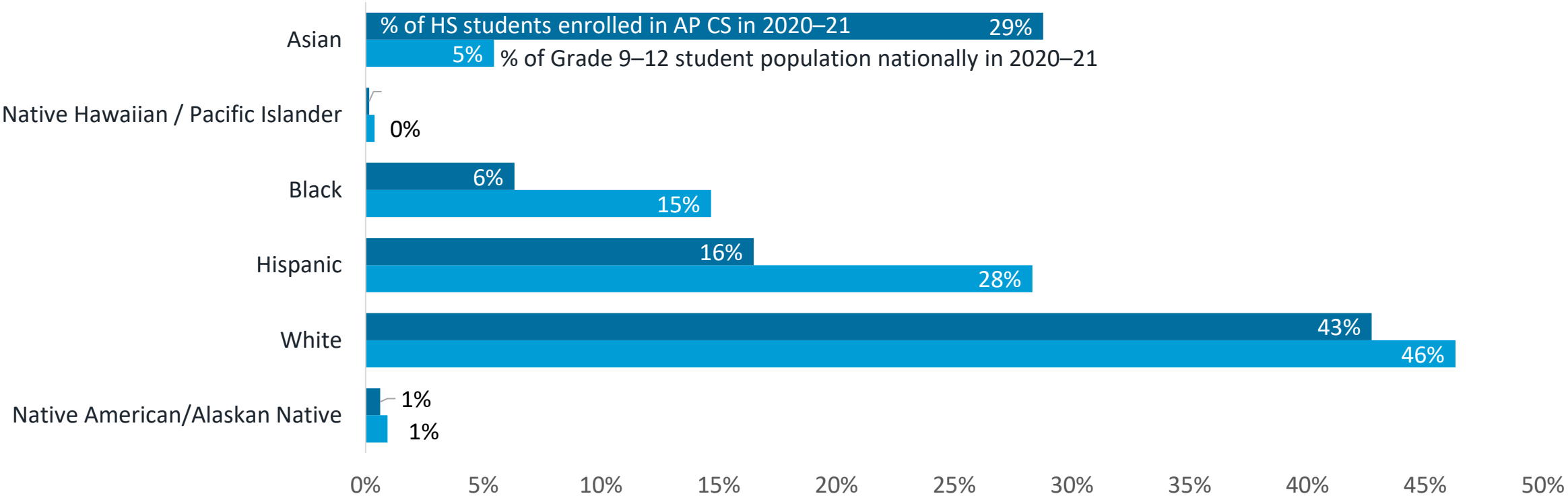
The 10 states with the highest percentage of NA/AN high school students increased their AP CS exam pass rate from 2019–20 to 2020–21



Data source. Retrieved from Code.org's 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

Percentage of NA/AN high school students enrolled in AP CS exam compared to the general Grade 9–12 student population by race/ethnicity in 2020–21

NA/AN enrollment in AP CS aligns with general Grade 9–12 student population in 2020–21: 1% nationally



Data source. Retrieved from Code.org’s 2021 and 2022 State of CS Annual Access Report. <https://code.org/yourschool/accessreport>

Considerations and Next Steps

What does the Code.org analysis tell us?

- This analysis provides a national, high-level overview of access to and enrollment in foundational computer science courses, AP course enrollment, and passing rates for Indigenous students.
- The results provide a baseline understanding of access to and enrollment in high school CS courses for Indigenous students in specific states and nationally overall and compared to their non-native peers.



What doesn't the Code.org analysis tell us?

- Enrollment in foundational CS courses not reported for several key states in the Code.org dataset where the highest populations of Native American/Alaska Native high school students live.
 - The following states did not report enrollment data in the 2021 Code.org State of CS Annual Report: AK, CA, CO, ME, MI, MN, NC, NH, OH, PA, RI, SD, VT. The following states did not report enrollment data in the 2022 Code.org State of CS Annual Report; AK, CA, CO, IL, ME, MI, MN, MT, NC, NH, OH, PA, RI, SD.
 - Enrollment data are available for 35 states.



What doesn't the Code.org analysis tell us? (continued)

- When Code.org requests CS information, when sample sizes are low (below 5), states can't share or need to mask those data. When reporting numbers by race/ethnicity or gender, the reporting statistics get even harder to report out for some categories.*
- States have even less available information to report about CS for kindergarten through Grade 8.*
- Before 2021, Code.org does not have publicly available data.*

* Based on feedback given by Code.org staff.



Limitations and the bigger picture

- There are several limitations to the Code.org data including not all states provided data or the years provided varied, sample sizes can mask data, and data is only available for 2022 and 2021, and the inconsistent data available for grades below Grade 8.
- The Code.org analysis can't tell us the “whys” to some of these questions (i.e., why Indigenous students attended high schools that offered CS at lower rates, or why some states with higher populations of Indigenous students had above average enrollment in CS).
- The Code.org analysis is part of a set of tasks within a study. Some other parts of the larger study can begin to address some of the whys.



Next Steps

The Study Coalition is engaging in other related tasks to inform this work:

- **Literature scan** of the literature on student interest in and access to CS for Indigenous youth
- **Wise practices** interviews with community members and elders to supplement the literature scan findings
- **Community research** with Indigenous communities to gain an understanding of computer science within these communities and ways to frame a future study

Overall Study Goal: These tasks will lead to a set of recommendations for a larger study to help improve CS educational pathways for Indigenous youth and support nation building, tribal sovereignty, and self-determination within tribal communities.

