INTRODUCTION
Compensatory Hyperinsulinemia (CH): the pancreatic response to early insulin resistance (IR)

- insulin secretion (pancreas)
- insulin sensitivity (muscle, liver, adipose)
- normal glucose & lipid tolerance

Research Question
How prevalent is CH in the U.S. and its subpopulations?

Hypothesis:
Compensatory hyperinsulinemia is prevalent in the U.S., especially in younger individuals.

Specific Aim:
Estimate the prevalence of CH in the U.S. population as a whole, and by subpopulations, for 2015-2018.

Experimental Approach:
- analyzed fasting subsample (n=6,227) of National Health and Nutrition Examination Survey (NHANES); combined 2015-2016 and 2017-2018 cycles
- weighted subsample represents non-institutionalized population
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PARTICIPANTS GROUPED BY METABOLIC STATUS

Reference Group (RG)
- normal fasting insulin (<9.0 microIU/mL)
- normal fasting glucose and A1C (no prediabetes)
- normal fasting TG and HDL (no metabolic syndrome)
- no diabetes mellitus

Compensatory Hyperinsulinemia (CH)
- hyperinsulinemia (fasting insulin >9.0 microIU/mL)
- normal fasting glucose and A1C (no prediabetes)
- normal fasting TG and HDL (no metabolic syndrome)
- no diabetes mellitus

Hyperglycemia/Dyslipidemia (HD)
- elevated fasting glucose or elevated A1C or elevated fasting TG or low HDL
- no diabetes mellitus

Diabetes Mellitus (DM)
- ADA diagnostic criteria or participant-reported provider diagnosis plus taking diabetes meds

RESULTS
CH prevalence is high in teenagers and decreases with age:
18.9% (CI: 15.8, 22.5), unadjusted
16.2% (CI: 15.7, 16.8), adjusted

Fig. 2 Prevalence of CH by age category, adjusted for sex, race/ethnicity and BMI.

CH prevalence varies by race/ethnicity:
9.9% (CI: 9.3, 10.5) Mexican American
10.4% (CI: 9.8, 11.1) Other Hispanic
6.7% (CI: 6.4, 7.0) Non-Hispanic White
12.8% (CI: 12.3, 13.3) Non-Hispanic Black
8.5% (CI: 7.9, 9.0) Non-Hispanic Asian
7.9 % (CI: 7.2, 8.6) Other/Mixed Race
22.8% (CI: 21.9, 23.6) Black Teens
19.1% (CI: 18.2, 20.1) Other Hispanic Teens

Fig. 5 Prevalence of CH by race/ethnicity, adjusted for age, gender and BMI.

CH is prevalent across all BMI categories:
9.0% (CI: 8.6, 9.3), BMI <25
7.7% (CI: 7.4, 8.1), BMI 25.0-29.9
7.8% (CI: 7.3, 8.2), BMI >=30

Fig. 4 Prevalence of CH by BMI category, adjusted for age, gender and race/ethnicity.

Table 1 U.S. prevalence by metabolic status

<table>
<thead>
<tr>
<th>Metabolic Status</th>
<th>Prevalence (95% CI)</th>
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<tbody>
<tr>
<td>RG</td>
<td>21.1% (19.1, 23.2)</td>
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<tr>
<td>CH</td>
<td>8.2% (7.2, 9.3)</td>
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<tr>
<td>HD</td>
<td>56.8% (54.6, 58.9)</td>
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<tr>
<td>DM</td>
<td>14.0% (12.6, 15.5)</td>
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Overall, 8.2% of U.S. population has CH: 22.1M people, ages 12 and above

SUMMARY & CONCLUSIONS
Compensatory hyperinsulinemia is prevalent in the U.S. and its subpopulations:
- U.S. prevalence: 8.2% overall
- teenagers have a high prevalence of CH: double the national average
- nearly 1 in 4 Black and Hispanic teens have CH, a hidden risk factor for diabetes
- teenagers with CH: target population for early screening and intervention to prevent prediabetes

Reference: Cistola and Dwivedi, Abstract 106

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