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Sodium Reduction: An Emerging Issue for Heart Disease and Stroke Surveillance

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CDC's CVD Surveillance Imperative

- Effectively tracking heart disease, stroke, and their risk factors is essential to the planning, implementation, and evaluation of heart disease and stroke prevention programs and policies nationwide. Sodium reduction is a key component of these efforts.
- Whether voluntary or regulatory, tracking all aspects of sodium reduction is KEY and an important part of our National Cardiovascular Disease Surveillance efforts.
- Uniquely positioned to coordinate sodium monitoring and surveillance by Federal agencies.



National Sodium Reduction Initiative (NSRI)

CDC support to NYC:

- 1) Statistical support in analyzing NHANES databases to determine baseline values of sodium for selected food groups.
- 2) Financial support for testing 24-hour urine collection for sodium.
- 3) Exchange of information on all aspects of sodium monitoring and surveillance.

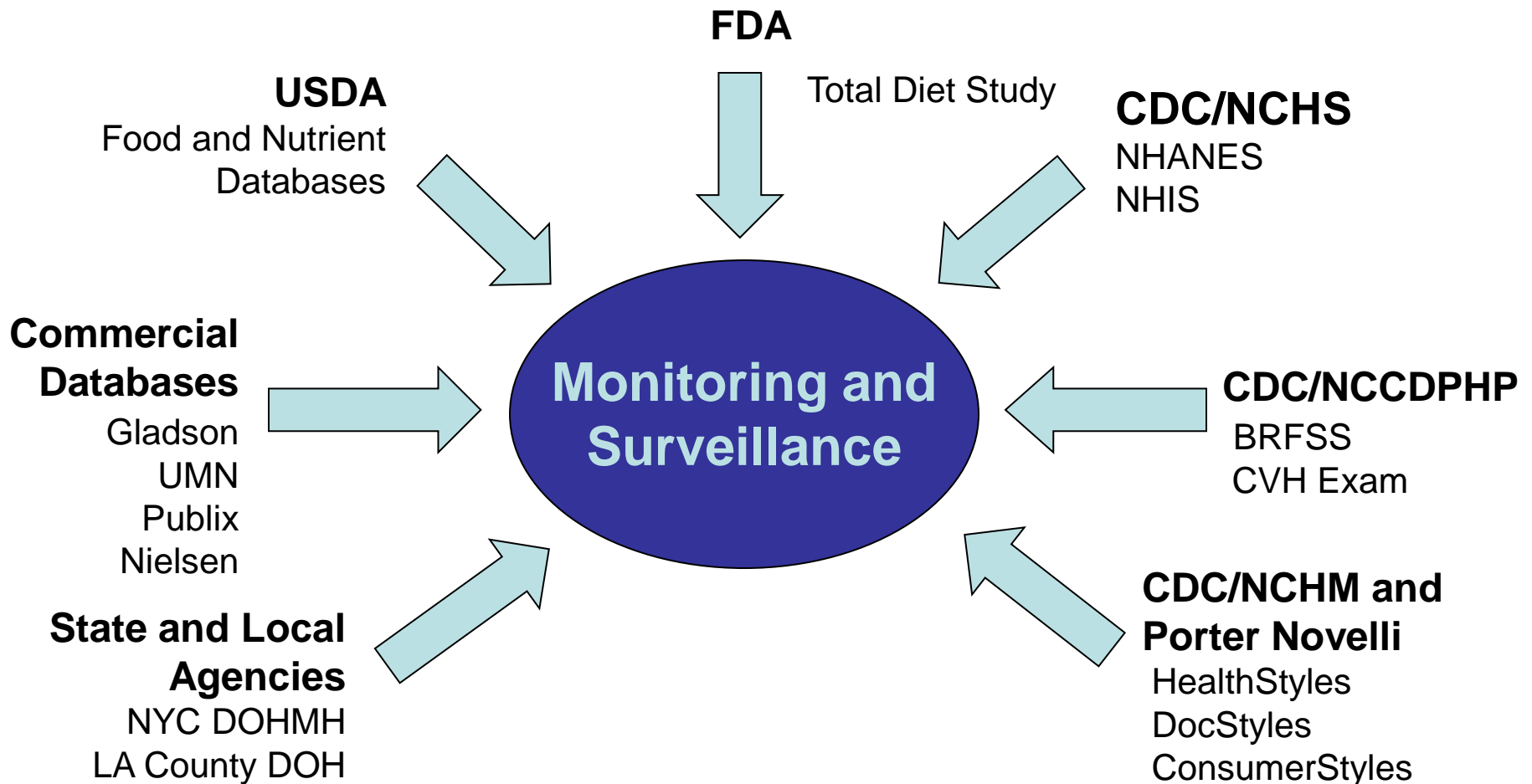


Source: New York City Department of Health and Mental Hygiene.



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CDC's Sodium Monitoring and Surveillance



Important Questions

- How much sodium is in the foods we eat?
- How much sodium are we consuming?
- What are the knowledge, attitudes and behaviors regarding sodium?
- What is the link with sodium reduction and health outcomes?
- Can we measure changes over time?



How much sodium is in the foods we eat?

- Establish baseline values for milligrams of sodium in selected food categories and chain restaurant foods.
- Assess progress in lowering sodium content in these foods.
- Prepare an surveillance reports documenting progress in lowering sodium in selected products of food manufacturers and chain restaurants.



FDA Total Diet Study: 1991-2005

- Purchase samples of food (market baskets) throughout the U.S. four times per year
- Acquired from supermarkets, grocery stores and fast food restaurants in three cities in each region and shipped to a central FDA laboratory.
- Prepare foods as they would be consumed (table-ready)
- Analyze the foods to measure the levels of selected contaminants and nutrients
- Approximately 300 Foods



USDA Food Composition Research

USDA Food and Nutrient Database for Dietary Studies

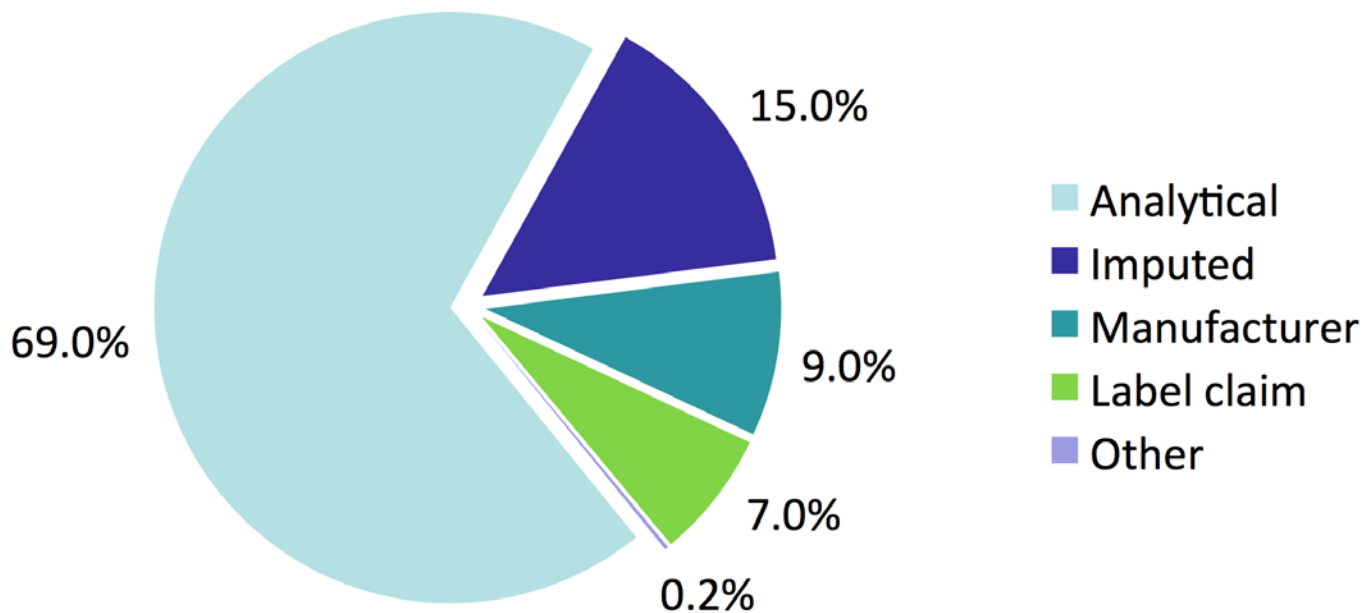
- Updated for each two-year survey data release.
- Used to process *What We Eat in America, NHANES 2005–2006*.

USDA Nutrient Database for Standard Reference

- Updated yearly.
- About 3,000 standard reference foods.
- Used for about 7,000 foods in nutrient database.



Sources of Sodium Data in Standard Reference Release 22



Limitations of Public Data

- Frequency of updates (i.e. white bread not analyzed since 1999).
- 5-25% variation between label claim and analytical.
- Lack of brand name information for many food categories.
- No private-label (generic) information.
- No linkage to sales or market share data.



CDC Combined Database Approach

- Expand the work of the NYC NSRI in establishing baseline values and exposure for packaged and restaurant foods.
- Utilize both public and commercial data sources.
- Advocate “Sentinel Food Surveillance” -- virtually impossible to effectively monitor all foods due to technical issues and cost.
- Identify and compile a list of “sentinel” packaged and restaurant foods that cover approximately 80% of sodium intake.
- Create the entire nutrient profile of the “sentinel foods.”
- Fund analyses by USDA to update selected foods (e.g., white bread) that are major contributors of sodium intake.



How much sodium are we consuming?

- Average intake = 3,466 mg/day (excludes table & cooking salt)
- 2005 Dietary Guidelines for Americans (DGA) recommendation is <2,300 mg/day.
- “Specific populations” recommended to consume $\leq 1,500$ mg/day:
 - Hypertensives
 - Blacks
 - Middle-aged (40) or older Americans
- “Specific populations” = 70% of American adults.



Source: Ayala C et al. Application of lower sodium intake recommendations to adults—United States, 1999–2006. *MMWR* 2009;58(11):281–283.



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NHANES 2007–2008, 2009–2010, 2011–2012

Two 24-hour dietary recalls:

- Two nonconsecutive days.
- Day 1 in-person at the Mobile Exam Center.
- Day 2 from central NHANES telephone number.
- Includes questions on salt added during cooking and while at the table or eating.
- Includes questions on whether the food was eaten at home.
- Daily aggregates of food energy and 63 nutrient/food components.
- USDA database used to process data for *What We Eat in America*.



Advantages of Using NHANES for Nationally Representative Data on Sodium Intake

- NHANES is the only national survey with extensive nutritional information.
- NHANES also collects urine specimens and measures blood pressure levels.
- Since 1999, NHANES has stored urine samples of participants aged 6 years and older.



Percentage of Persons Who Met the Daily Sodium Recommendation and Average Sodium Intake, by Risk Group

	Met the 2005 DGA Recommendation	Daily Sodium Intake (Mean)
All Adults	9.6%	3,466 mg
<2,300 mg/day Recommended	18.8%	3,691 mg
≤1,500 mg/day Recommended	5.5%	3,366 mg
<i>With hypertension</i>	5.9%	3,299 mg
<i>Without hypertension, aged 40 years and older</i>	5.1%	3,410 mg
<i>Without hypertension, black, aged 20–39 years</i>	5.7%	3,511 mg



Source: Peralez-Gunn et al. Sodium Intake Among Adults – United States, 2005-2006. *MMWR* 2010;59(24):746-749.



Median U.S. Sodium Intake (mg/day)

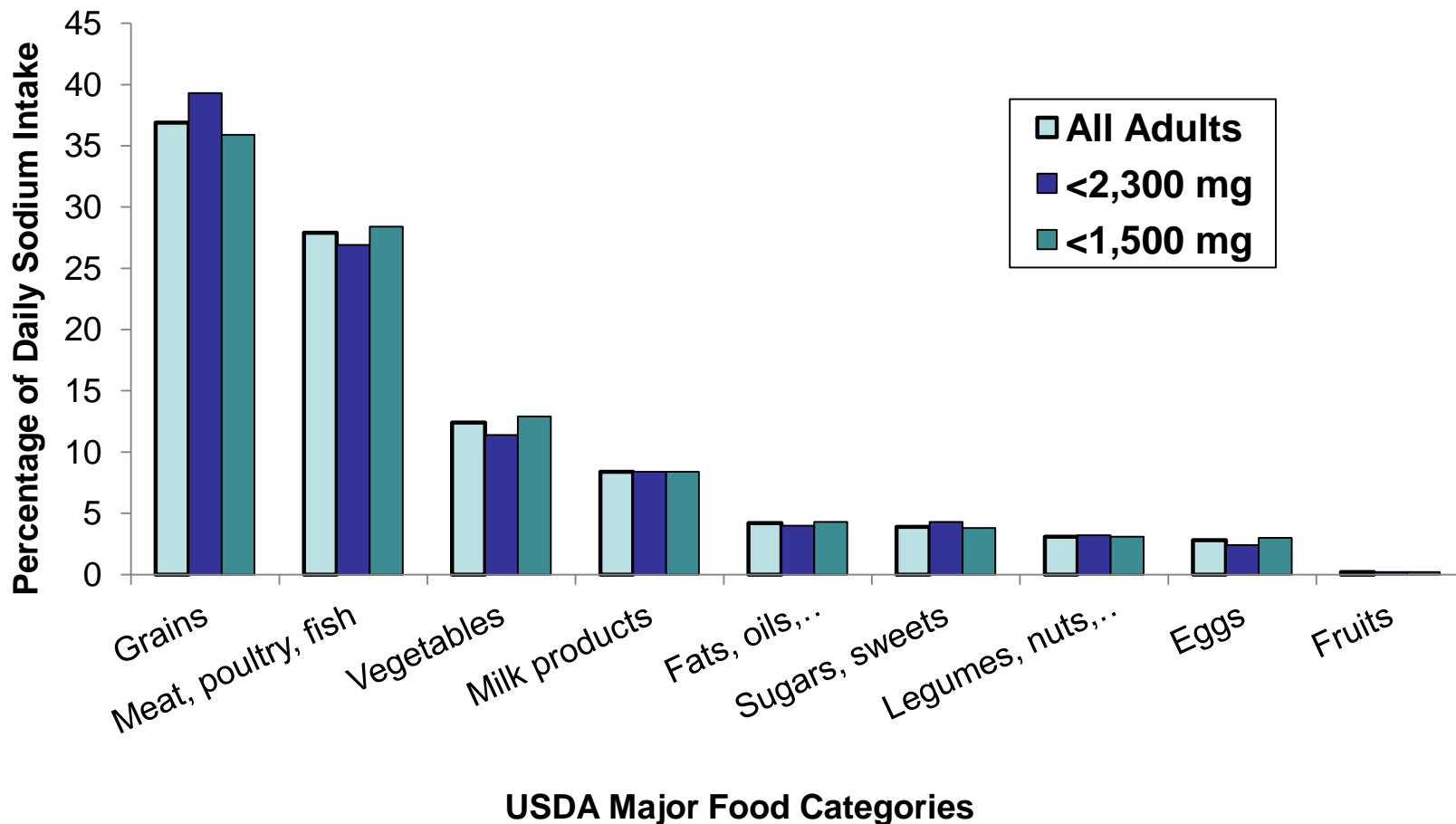
	Male	Female
9–13 years	3,321	3,068
14–18 years	3,909	2,953
19–30 years	4,139	3,114
31–50 years	4,222	2,986
51–70 years	3,568	2,710
71+ years	3,065	2,375

Source: NHANES, 2005-2006

Source: Peralez-Gunn et al. Sodium Intake Among Adults – United States, 2005-2006. *MMWR* 2010;59(24):746-749.



Percentage of Daily Sodium Intake for Nine Major Food Categories, by Total Population and Risk Groups



Source: Peralez-Gunn et al. Sodium Intake Among Adults – United States, 2005-2006. *MMWR* 2010;59(24):746-749.



Added Salt

	Frequency of Use				
	Never	Rarely	Occasionally	Very Often	Don't Know
Table salt use	28.2%	30.6%	23.6%	17.5%	0.1%
Salt use in food preparation	9.6%	19.1%	35.8%	34.6%	0.9%

(n = 5,005)
Source: NHANES 2005-2006



Source: Peralez-Gunn et al. Sodium Intake Among Adults – United States, 2005-2006. *MMWR* 2010;59(24):746-749.



CDC Approach to Biologics

Continue to evaluate the utility of 24-hour urine studies for national surveillance compared to other modalities:

- Co-Fund pilot study to examine the utility of 24-hour urine studies compared to the existing urine studies in NHANES.
- Provided funding support for testing 24-hour urine collection for sodium in the NYC NSRI.
- Collaborate on analysis of historic NHANES urine samples for sodium and other nutrients.
- Fund further analysis of InterSALT/InterMap data.



Urine Sodium in the US Population: NHANES 1988-2010

- Using stored casual urine samples from different NHANES survey periods:
 - Investigate potential trends in urine sodium in the adult US population (20-59 y) over approximately two decades (1988-2010) and
 - Develop reference estimates of urine sodium in the US population (≥ 6 y) during 2010.
- Measure also urine potassium, another modulator of blood pressure, to allow calculation of Na/K excretion ratio.
- Measure also urine chloride to help evaluate sodium intake in the context of salt intake (NaCl).
- Co-funded by NCCDPHP and NCEH (CDC).



Urinary Sodium Validation Study

- Collaborate on validation studies of several spot urine tests throughout a 24-hour period compared to the gold standard of a combined 24-hour urine collection using NHANES methodology.
- 24-hour dietary recall and BP measurement.
- Sample size estimated at 450.
- CDC will provide funding, collaborate on protocol development and resulting analyses.



InterSALT Data Analysis

- Comparative analyses of a 24-hour urine samples, spot urine samples and 24 hour dietary recall from US participants.
- High volume and Statistical Power.
- 3 modalities exist in very few studies.
- CDC requested and is funding this analysis.



What are the knowledge, attitudes and behaviors regarding sodium?

- National Health Interview Survey (NHIS)
- Behavioral Risk Factor Surveillance System (BRFSS)
- HealthStyles, DocStyles and ConsumerStyles
- Cardiovascular Health Examination Surveys (where available)



Buying Food

How often do you or the person who shops for your food buy items that are labeled “low salt” or “low sodium”? Would you say:

- Always
- Often
- Sometimes
- Rarely
- Never
- Don't shop for food



Source: NHIS (1998) unpublished data.



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Frequency of Buying “Low Salt” Items

	Frequency of Buying “Low Salt” Items by Gender					
	Always	Often	Sometimes	Rarely	Never	Don't Shop for Food
All	11.7%	12.8%	22.8%	17.3%	27.0%	8.4%
Male	10.5%	11.4%	19.9%	16.0%	27.8%	14.4%
Female	12.8%	14.0%	25.4%	18.5%	26.3%	2.9%

SOURCE: NHIS (1998) unpublished data.



National Health Interview Survey (NHIS)

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Behavioral Risk Factor Surveillance System (BRFSS)

- Has a doctor or other health professional ever advised you to do any of the following to help lower or control your high blood pressure:
 - Change your eating habits?
 - Cut down on salt?
- Are you now doing any of the following to help lower or control your high blood pressure:
 - Changing your eating habits?
 - Cutting down on salt?



Behavioral Risk Factor Surveillance System (BRFSS) Proposed

- Doctor or health professional advice to reduce salt intake
- Now cutting down salt intake
- Buy items labeled “low salt” or “low sodium”
- How often eat processed meats
- How often eat ready-to-eat or fast foods



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“Styles” Surveys Proposed

- ConsumerStyles, DocStyles and HealthStyles
 - Health provider advice to reduce and control hypertension
 - Health provider sodium reduction advice
 - Health provider advice on lifestyle changes
 - Consumer attitudes & knowledge about sodium reduction
 - Consumer support of sodium reduction policies
 - Consumer diet behavior and choices
 - Consumer strategies to lower sodium in diet
 - Various other question types



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- Kate Shaw, MS



For More Information

- CDC Sodium Web Page:
<http://www.cdc.gov/dhdsp/library/sodium.htm>
- Robert K. Merritt
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The findings and conclusions in this presentation are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



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