

Monitoring Outcomes for Zika Prevention Knowledge and Behaviors in Dominican Republic, El Salvador, Guatemala and Honduras

SMS MONITORING SURVEY: FINAL REPORT

September 2017



USAID
FROM THE AMERICAN PEOPLE



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ACRONYMS

CCP	Johns Hopkins University Center for Communication Programs
GBS	Guillain-Barre Syndrome
HC3	Health Communication Capacity Collaborative
IRB	Institutional Review Board
KAP	Knowledge, Attitudes and Practice
PSI	Population Services International
SBCC	Social Behavior Change Communication
SMS	Short Message Service
UNICEF	United Nations International Children's Education Fund
USAID	United States Agency for International Development
WHO	World Health Organization

INTRODUCTION

Background

Zika is a communicable disease transmitted by the *Aedes aegypti* species of mosquito. This mosquito is common to Latin and Central American countries and also transmits the Dengue and Chikungunya viruses. The female *Aedes* mosquito bites mostly during the day and breeds in “clean” and/or standing water such as that usually found in containers around people’s homes. While the Zika virus is not a new virus, the current outbreak is the largest ever reported and it continues to spread rapidly throughout the Americas. Eighty percent of individuals infected with Zika are asymptomatic, while the remaining 20 percent experience mild symptoms including fever, rash, joint pain and conjunctivitis (pink eye).

The recent Zika outbreak coincided with a rise in reported cases of two severe neurological conditions, specifically Guillain-Barre Syndrome (GBS) and microcephaly. There is scientific consensus among the research community that the Zika virus is a cause of microcephaly and GBS. There is no cure or vaccine for Zika infection, so preventative measures that focus on vector control, awareness of risk, and risk reduction strategies for at-risk populations are important components of Zika prevention programs.

The Health Communication Capacity Collaborative (HC3) – based at the Johns Hopkins Center for Communication Programs (CCP) – is supporting stakeholders in Honduras, El Salvador, Dominican Republic and Guatemala, as well as Paraguay and Jamaica to develop strategic documents and operational plans to guide national and subnational Social and Behavior Change Communication (SBCC) initiatives to address Zika. In addition to this work, USAID requested collection of Zika-related data from USAID-funded program areas to provide information on the level of knowledge about Zika prevention and individual prevention behaviors that may inform funded programs regarding issues of relevance to their Zika program activities.

HC3 Zika Project

The HC3 Zika program began in March 2016 under a scope of work around landscaping Zika communication activities and gaps in four focus countries; this work was expanded to include Paraguay and Jamaica in March 2017. HC3 activities include working with governments, implementing partners and local stakeholders to develop or refine Zika strategic communication plans for coordinated and harmonized activities in each country. In support of the communication activities, HC3 conducted a quantitative short message service (SMS) survey in the four focus countries to derive estimates for specific Zika-related knowledge and prevention behavior indicators prioritized by USAID. This work was initially conceived and developed as a monitoring activity to feed specific indicators on knowledge and prevention of Zika. Three waves of data collection were conducted during January to February 2017, April to May 2017 and June to July 2017 to derive estimates for the indicators.

SMS Survey Target Area

The SMS survey targeted individuals living in areas where there were USAID-funded programs related to Zika prevention and care. The identified survey sites were intersected with Zika case prevalence estimates documented by WHO and national health authorities. Sites with high Zika case prevalence and a USAID-funded program were selected from each of the four participating countries. Of note, at the time of planning for wave 1 data collection, not all the geographic-location information about sites for USAID-funded programs was available. Based on the information available at the time, a selected list of departments were the initial focus for survey administration during the planning phase for the survey. As USAID’s scope of activities expanded in the area, the list of departments was broadened to include these regions of interest during subsequent waves of data collection.

Table 1: List of SMS Survey Areas

* Indicate Areas Added in Survey Wave 3

Country	Department/Province
GUATEMALA	Santa Rosa
	Chiquimula
	Quetzaltenango
	Zacapa
	Jalapa
	Suchitepequez
	Escuintla
	Retalhuleu
	Izabal
	El Progreso*
	Guatemala*
	Huehuetenango*
	Jutiapa*
	Quiche*
	Sacatepequez*
San Marcos*	
Peten*	
Tonicapan*	
HONDURAS	Cortes
	Francisco Morazan
	Yoro
	Olancho
	Santa Barbara
	Choluteca
	El Paraíso
	Atlantida
	Comayagua
	Colon*
	Copan*
	Intibuca*
	La Paz*
	Lempira*
	Ocotepeque*
Valle*	

Country	Department/Province
EL SALVADOR	San Salvador
	La Libertad
	Chalatenango
	Cuscatlan
	Santa Ana
	Cabañas
	San Vicente
	San Miguel
	Ahuachapán*
	La Paz*
	La Union*
	Morazan*
	Sonsonate*
	Usulután*
DOMINICAN REPUBLIC	Santo Domingo
	Distrito Nacional
	San Cristobal
	Santiago
	Puerto Plata
	Azua
	Independencia
	Duarte
	Baoruco*
	Barahona*
	San Juan*
	La Vega*
	La Altagracia*
	La Romana*

Aims & Objectives

The objective of the Zika SMS survey was to provide data from USAID funded program sites to feed the following complex indicator, provided by the funder:

The percentage of pregnant women/women of reproductive age and their sexual partners who have correct knowledge of the risks of Zika infection during pregnancy, voluntary contraceptive options including condom use, and use of personal protective measures to prevent Zika virus infection.

After data collection was completed for wave 1, the objective was further refined by the funder to:

The percentage of pregnant women/women of reproductive age and their sexual partners who have correct knowledge of the risks of Zika infection during pregnancy and use of personal protective measures, including condom use, to prevent Zika virus infection.

Indicators

The overarching indicator was simplified to produce five focused and specific indicators with single measurable targeted behaviors across two domains of enquiry; knowledge of Zika infection, transmission and prevention, and individual self-action to prevent Zika infection.

A. Knowledge of Zika Infection

- 1.0 Knowledge of Transmissions and Risks of Zika Infection
 - 1.1 Percentage of individuals of reproductive age with correct knowledge about Zika (transmission and risks)
- 2.0 Knowledge of Prevention of Zika Infection
 - 2.1 Percentage of individuals of reproductive age with correct knowledge of voluntary contraceptive options to prevent Zika infection
 - 2.2 Percentage of individuals of reproductive age with correct knowledge of personal protective measures to prevent Zika infection

B. Zika Prevention Behaviors

- 3.0 Practice of Self-action to Prevent Zika
 - 3.1 Percentage of individuals of reproductive age who are implementing personal protective measures to prevent Zika infection
 - 3.2 Percentage of pregnant women who are using personal protective options, including condoms to prevent Zika infection

Estimates from these indicators were expected to provide information about the status of knowledge and self-action for preventing Zika infection in high prevalence areas where USAID is funding Zika-related programs. They would also provide beneficial information for HC3 and program partners to use in prioritizing and strategizing effective interventions to combat Zika.

SMS SURVEY METHODS

Target Population

The target population for the SMS survey was women and men of reproductive age living in specific geographic areas in each country where USAID-funded programs were being implemented.

Sample Size

At the time of methodological design, there were no population estimates in the literature for knowledge of Zika transmission, risks, and prevention, and for adoption of protective behaviors, for the four target countries. Consequently, the sample size was calculated using a formula that would provide maximum variation in the sample i.e. p characteristic of interest was set at 50%. With power set at 80%, alpha of .05, and contingency for a 30% response rate, the minimum sample size per country was about 1000 individuals per country, and an overall sample of 4000.

Questionnaire Development

To address the specific indicators listed above, HC3 identified questions using the question bank provided by the World Health Organization (WHO) Resource Pack on Knowledge, Attitudes and Practice surveys: Zika Virus Disease and Potential Complications. The draft questionnaire was refined with the use of tested questions from questionnaires also being used by partners in the target area, including the World Vision Knowledge Attitudes and Practice (KAP) survey and the PSI/PASMO Omnibus. After discussion and revision with USAID, the final questionnaire was translated to Spanish and then proofed for errors and context by HC3 staff in Baltimore.

SMS Survey Approach

Short messaging service (SMS) method was used to collect data from the target areas. This particular method was selected in order to gather monitoring data in this assessment due to the ability to reach populations living in rural areas that may not be easily accessible, as well as quick feedback via immediate SMS response. Given a short timeline to conduct a baseline assessment prior to the implementation of communication strategies in various departments and the reach and rapid response of SMS surveys, this method proved to be most advantageous. A local contractor with experience conducting SMS services in the project area was contracted to do this work. The contractor was provided the questionnaire for the survey and used Avtek's SMS/Asterisk software product to operationalize the survey.

Working with local telecommunication agencies in each country, the contractor sent an invitation to participate in a Zika survey to a random burst of cell phone numbers registered to individuals in the target program area. The message introduced the survey and invited individuals to voluntarily participate in a Zika-related survey. The text message invitation received by participants was:

*Gane (monto) combatiendo al Zika. Ayúdenos: conteste 9 preguntas sencillas, acepta? A-Si B-No
Win (amount) fighting Zika. Help us answer 9 simple questions, do you accept? A – Yes B – no*

Individuals who accepted the invitation by sending a text message indicating their willingness to participate back to the contractor were screened for the following eligibility criteria:

1. Individuals of reproductive age, specifically, females 15-49 years of age, and males 18-59 years of age
2. Place of residence in the last month (in one of the selected USAID-funded program sites)

Those not meeting eligibility criteria were notified of such, thanked for their interest, and filtered out of the respondent list. Individuals meeting the eligibility criteria were notified of such, informed they would receive approximately a \$5 equivalent top up of units on their phones at the completion of the questionnaire, and then were forwarded the questionnaire for their completion.

Participants received the questions via SMS and responded to the questions using SMS.



Each question was submitted back to the contractor as it was completed and was aligned with a unique case number assigned to the participating cell phone number. Completed questionnaires that were returned to the contractor were compiled in a database. Additional bursts of cell phone numbers were added to the pool of potential participants as needed until the database had achieved the desired sample of at least 1000 unique case numbers with completed questionnaires, per country. At this point, access to the survey was disconnected. Partially completed questionnaires were then removed from the database, and only questionnaires completed in entirety were included in the final database.

Trial Phase

The local vendor contracted to conduct the SMS surveys conducted several trials of the questionnaire and the process to assess the level of understanding of the questionnaire, the feasibility of completing questionnaires on non-android phone platforms, the response rate to the questionnaire, and to measure the percentage of “drop outs” or respondents who do not complete the questionnaire.

In the first test, the questionnaire was sent to 400 internal employees. The results showed that only four respondents completed the survey (1%), and no responses were provided for multiple answer questions. Analysis of problems reported by employee participants revealed that the length of the survey, the complexity of the questions, and use of non-android phones to respond to the survey influenced completion rates.

The questionnaire was modified to reduce complexity of questions, and a second test was done among a larger burst of 4750 cell phone numbers in Guatemala only. There were only 30 completes which was a response rate of <1%.

An investigation by the local contractor of the poor response rate identified several factors that negatively influenced the successful administration of the SMS through these trial bursts.

- Although CCP had repeatedly successfully administered SMS questionnaires of similar length in sub-Saharan Africa, the length of the questionnaire implemented in the trial runs (12 questions) seemed to be too extensive for the Latin American setting.
- The questions were still considered lengthy and complex and often overflowed the small screens of non-android phones commonly used in the target area, making it cumbersome to read for some individuals. For SMS surveys, the vendor informed us that the software allowed only 150 characters for the question and all response option.
- Multiple and lengthy response options to the questions could not be easily viewed and selected by participants as they overflowed the visual space of the screen
- Several questions required multiple-choice responses and this resulted in a higher cost to the vendor as well as to participants. In the target countries where there are few customer options for monthly packages for SMS services, there is a cost for every text character in response to the SMS survey (including for incompletes and abandoned questionnaires). These charges are passed on to the participants, often causing participants to run out of units on their cell phone before they could complete the questionnaire and they were forced to stop or abandon it prematurely. This differed from SMS survey administration in other geographical areas, including some sub-Saharan countries where SMS survey responses are free to participants, regardless of character length, versus topping up cell phone credits after the survey is completed in Central America and the Caribbean.
- At the time of the survey, in El Salvador and Guatemala, violent gangs known as “maras” were reported to be using cell phones as a way to extort money from individuals and conduct kidnappings. As a result, in these areas, individuals who received the survey believed it to be a hoax or scam and were hesitant to participate in any SMS based questionnaire due to fear of extortion.

With knowledge about these issues, the questionnaire was again revised to facilitate ease of administration and to improve both the response and completion rate. The following revisions were made to the questionnaire:

- The questionnaire was divided into a 10-item knowledge questionnaire (Q1) and an eight-item self-action questionnaire (Q2).
- Questions with multiple response options were re-worded to questions with dichotomous categorical responses, such as ‘True’, ‘False’, and ‘Yes’, ‘No’, responses.
- The Contractor initiated an information campaign in the areas where the response rate was being impacted by the maras to inform about the legitimacy of the survey among the communities.
- Participants were given part of their incentive for participating up front so that they would not run out of credit midway through the survey. The remaining incentive was credited to their accounts upon receipt of a completed survey.

Data Collection Tools

The final instruments used for data collections were two separate quantitative surveys: Q1 focused primarily on knowledge of transmission, risk and prevention of Zika infection, and Q2 focused on self-action implemented by individuals to protect themselves and their family from Zika infection. Each questionnaire had four standard questions related to participant demographics; specifically, the department or municipality where they lived, their gender, age, and pregnancy status.

Q1: Zika SMS Monitoring Questionnaire for KNOWLEDGE

1. In which [municipality/department/province] have you slept the most in the last 30 days? (Write in)
2. Are you male or female?
 - a. Male
 - b. Female
3. How old are you today?
(Write in)
4. Are you or your partner pregnant now?

- a. Yes
 - b. No
 - c. I don't know.
5. A person can get Zika through sex.
 - a. True
 - b. False
 - c. I don't know.
 6. A person can get Zika from a mosquito bite.
 - a. True
 - b. False
 - c. I don't know.
 7. A pregnant woman with Zika could have: (Check all that are correct.)
 - a. Miscarriage
 - b. Baby with small head
 - c. Baby with disabilities
 - d. None of these
 - e. Don't know
 8. Which of the following will reduce the risk of Zika? (Check all that are correct)
 - a. Mosquito repellent
 - b. Condom
 - c. Screens on windows/doors
 - d. Scrub water containers
 - e. None
 9. Most people with Zika won't have any symptoms.
 - a. True
 - b. False
 - c. I don't know.
 10. Which of the following is a symptom of Zika? (Check all)
 - a. Fever
 - b. Red eyes
 - c. Rash
 - d. Body pain
 - e. None of these

Q2: Zika SMS Monitoring Questionnaire for Self-action FOR PREVENTION

1. In which [municipality/department/province] have you slept the most in the last 30 days? (Select one)
2. Are you male or female?
3. How old are you today?
4. Are you or your partner pregnant now?
 - a. Yes
 - b. No
 - c. Don't Know
5. Using condoms can prevent a pregnant person from getting Zika.
 - a. True
 - b. False
 - c. Don't Know
6. In the last month, I used mosquito repellent to prevent Zika.
 - a. Yes
 - b. No
7. In the last month, I used condoms to prevent Zika.
 - a. Yes
 - b. No

8. [Wave 1 only] If you think you were exposed to Zika while pregnant, where would you go for help? (Write in response)
9. [Waves 2 & 3] In the last month, I have removed standing water or scrubbed water containers in my home to prevent Zika.
 - a. Yes
 - b. No

Modifications between Survey Wave 1 and Wave 3

In order to improve the data collection process, the following modifications were made:

- Improved geographic filtering process: The local vendor was able to improve the geographic filter by negotiating with the local telecommunications companies to use cell tower information to identify specifically from where data was transmitting. This strategy provided an additional layer of information to the vendor about where data responses were originating and improved the ability to filter responses to our expected target areas.
- Expanded geographic areas: Additional geographic target areas were included in the filter for wave 2 to wave 3 as USAID's scope of funded activities expanded in the target countries.
- Modified questionnaire: After wave 1, the question regarding care-seeking behaviors (*"If you think you were exposed to Zika while pregnant, where would you go for help?"*) was removed; almost all participants responded that they would seek care from health facilities and trained providers and it was felt that continuous monitoring of this variable would not yield new information. This question was replaced with the following self-action question, *"In the last month, I have removed standing water or scrubbed water containers in my home to prevent Zika,"* (Yes/No).

Analysis

This report summarizes results from a comparison of outcomes monitoring data derived from wave 1 and wave 3. Tests of significance for differences in proportions were conducted at the country level.

Research Ethics and Institutional Review

The Johns Hopkins University Institutional Review Board (IRB) reviewed the protocol, and approved it with a committee determination of non-human subjects research, program monitoring and evaluation.

RESULTS

This section summarizes the results from analyses of two waves (waves 1 and 3) of SMS questionnaires used to collect monitoring data from USAID-funded Zika prevention program areas in the Dominican Republic, El Salvador, Guatemala, and Honduras. The first wave was conducted between January and February 2017. The third wave was conducted in July 2017. Both waves included two separate surveys: the Zika knowledge survey and the Zika self-action survey. Findings from waves 1 and 3 are compared below. Analyses include overall estimates and subgroup analyses by country, gender, pregnancy status (pregnant women vs. overall as well as pregnant women and partners of pregnant women vs. overall), and age group (adolescents 15-19 years old, youth 20-24 years old, adults 25 years and older). Significant tests of proportion were conducted at the country level to assess significance of differences between wave 1 and wave 3. P-values are presented for those comparisons that were significant (below the 0.05 level).

The results section describes the demographics of the knowledge-focused survey, followed by a comparative description of the wave 1 and wave 3 results. Each question is analyzed by country and overall, by gender, by pregnancy status (women and female partners of male participants, women only), and age groups (adolescents, youth, and adults).

Distribution of Survey Sample

Wave 3 Knowledge Survey

The total sample for the wave 3 knowledge survey included 4106 participants from four countries. Each country composed approximately one quarter of the total sample, with 1037 participants from Guatemala, 1060 from Honduras, 1006 from El Salvador, and 1003 from Dominican Republic.

Demographic characteristics of the wave 3 knowledge survey are shown in Table 2. The mean age was 29.4 years (SD: 9.8). Participants in the Dominican Republic had slightly higher mean ages than participants from other countries. Approximately half (51.3%) were female. In Honduras, slightly more women (52.1%) than men participated. About 11% of the sample was pregnant or had a partner that was pregnant at the time of the survey. Adolescents (15–19 years of age) were 15.4% of the total sample, and youth (20–24 years of age) were nearly one quarter (24.1%) of the total sample. While only 11.3% of participants from the Dominican Republic were adolescents, 17.8% of participants from Guatemala were from 15 to 19 years of age.

Table 2. Description of wave 1 knowledge survey sample

Characteristic	Guatemala	Honduras	El Salvador	Dominican Republic	Overall
Mean Age (yrs)	25.1 (*SD: 8.0)	27.1 (SD: 8.5)	28.6 (SD: 9.4)	29.0 (SD: 9.7)	27.3 (SD: 9.3)
Females	40.3	48.1	56.1	56.0	50.3
Pregnant	4.9	8.1	4.1	4.4	5.3
Adolescents (15-19 yrs)	29.0	18.0	20.0	16.7	20.9
Youth (20-24 yrs)	27.7	28.7	19.9	24.3	25.1
Adults (25 yrs +)	43.3	53.3	60.1	59	54

*Standard deviation (SD)

Table 3. Description of wave 3 knowledge survey sample

Characteristic	Guatemala	Honduras	El Salvador	Dominican Republic	Overall
Mean Age (yrs)	27.6 (SD: 9.0)	29.3 (SD: 9.5)	29.3 (SD: 9.5)	31.6 (SD: 9.5)	29.4 (SD: 9.8)
Females	51.0	52.1	51.7	50.5	51.3
Pregnant	6.6	10.1	10.8	16.7	11.0
Adolescents (15-19 yrs)	17.8	16.1	16.3	11.3	15.4
Youth (20-24 yrs)	29.7	21.5	24.0	21.0	24.1
Adults (25 yrs +)	52.5	62.4	59.7	67.7	60.5

Wave 3 Self-action Survey

The total sample for the wave 3 self-action survey included 4047 participants. Each country composed about one quarter of the final sample, with 1008 participants from Guatemala, 1005 from Honduras, 1006 from El Salvador, and 1028 from Dominican Republic.

Demographic characteristics of participants in the wave 3 self-action survey are presented in Table 3. The mean age of the self-action sample was 30.4 years (SD: 10.2 years). Approximately 50% of the sample was female (48.9%). Slightly less than half (46.5%) of participants in El Salvador and slightly more than half of participants from Guatemala were female (54.1%). About 11% of the overall sample was pregnant or had a partner that was pregnant at the time of the survey. Adolescents were 13.6% of the sample, while youth were nearly 23% of the overall sample (22.8%).

Table 4. Description of wave 1 self-action survey sample

Characteristic	Guatemala	Honduras	El Salvador	Dominican Republic	Overall
Mean Age (yrs)	28.0 (*SD: 9.4)	29.2 (SD: 9.7)	32.1 (SD: 10.2)	32.3 (SD: 10.9)	30.4 (SD: 10.2)
Females	54.1	49.4	46.5	45.9	48.9
Pregnant	7.3	16.3	10.0	10.3	11.0
Adolescents (15-19 yrs)	18.1	16.4	8.7	11.1	13.6
Youth (20-24 yrs)	28.3	23.2	20.3	19.5	22.8
Adults (25 yrs +)	53.7	60.4	71.0	69.5	63.7

*Standard deviation (SD)

Table 5. Description of wave 3 self-action survey sample

Characteristic	Guatemala	Honduras	El Salvador	Dominican Republic	Overall
Mean Age (yrs)	28.0 (SD: 9.4)	29.2 (SD: 9.7)	32.1 (SD: 10.2)	32.3 (SD: 10.9)	30.4 (SD: 10.2)
Females	54.1	49.4	46.5	45.9	48.9
Pregnant	7.3	16.3	10.0	10.3	11.0
Adolescents (15-19 yrs)	18.1	16.4	8.7	11.1	13.6
Youth (20-24 yrs)	28.3	23.2	20.3	19.5	22.8
Adults (25 yrs +)	53.7	60.4	71.0	69.5	63.7

Knowledge

Knowledge of Zika

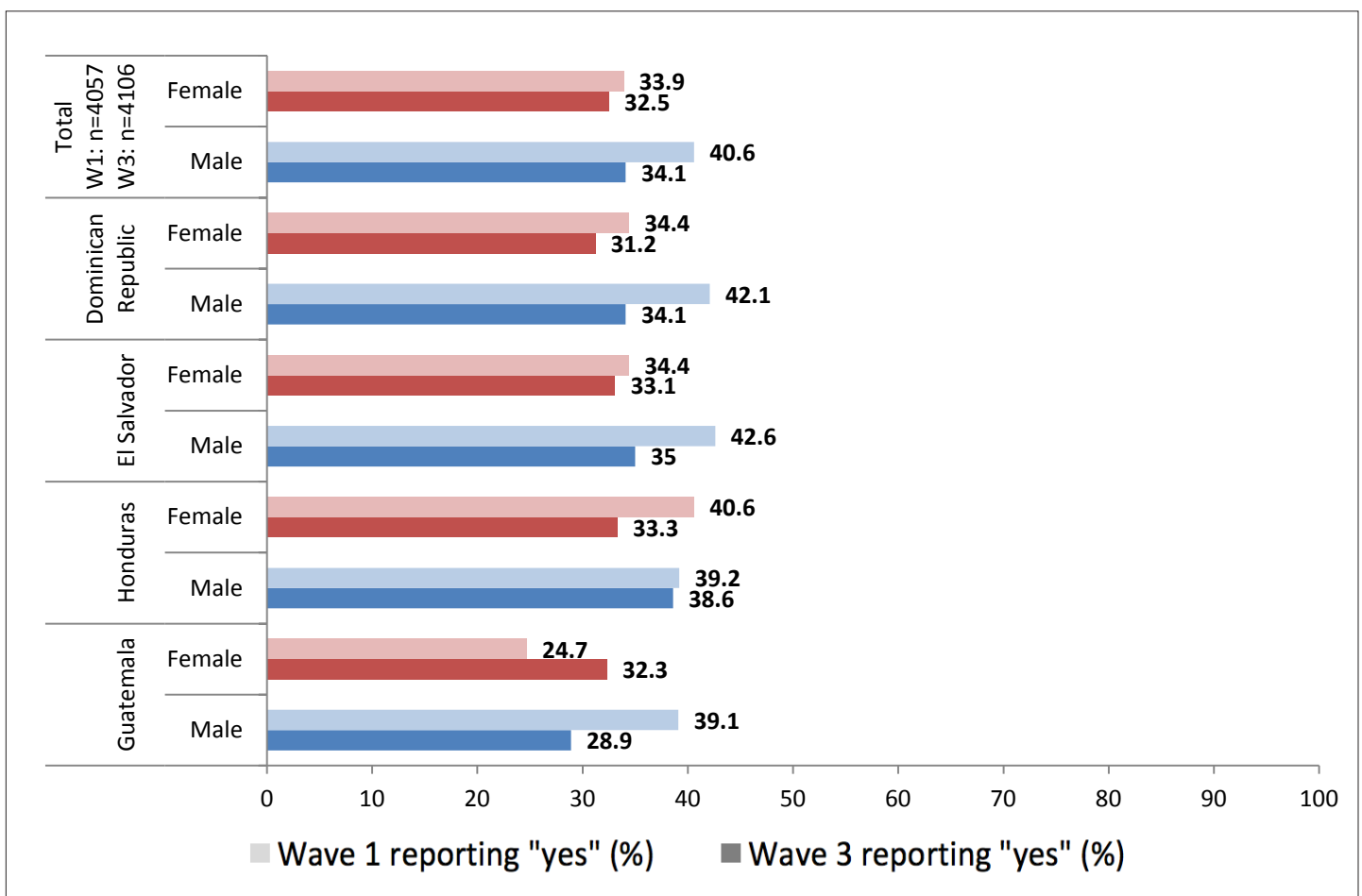
This section summarizes knowledge of Zika transmission, effects of Zika and Zika symptoms.

Knowledge that a person can get Zika through sex

Overall, there were no significant positive differences between knowledge that a person can get Zika through sex from wave 1 to wave 3. In fact, in the Dominican Republic and overall, wave 3 knowledge of sexual transmission of Zika was statistically significantly lower than wave 1 ($p=0.014$, $p=0.0002$ respectively).

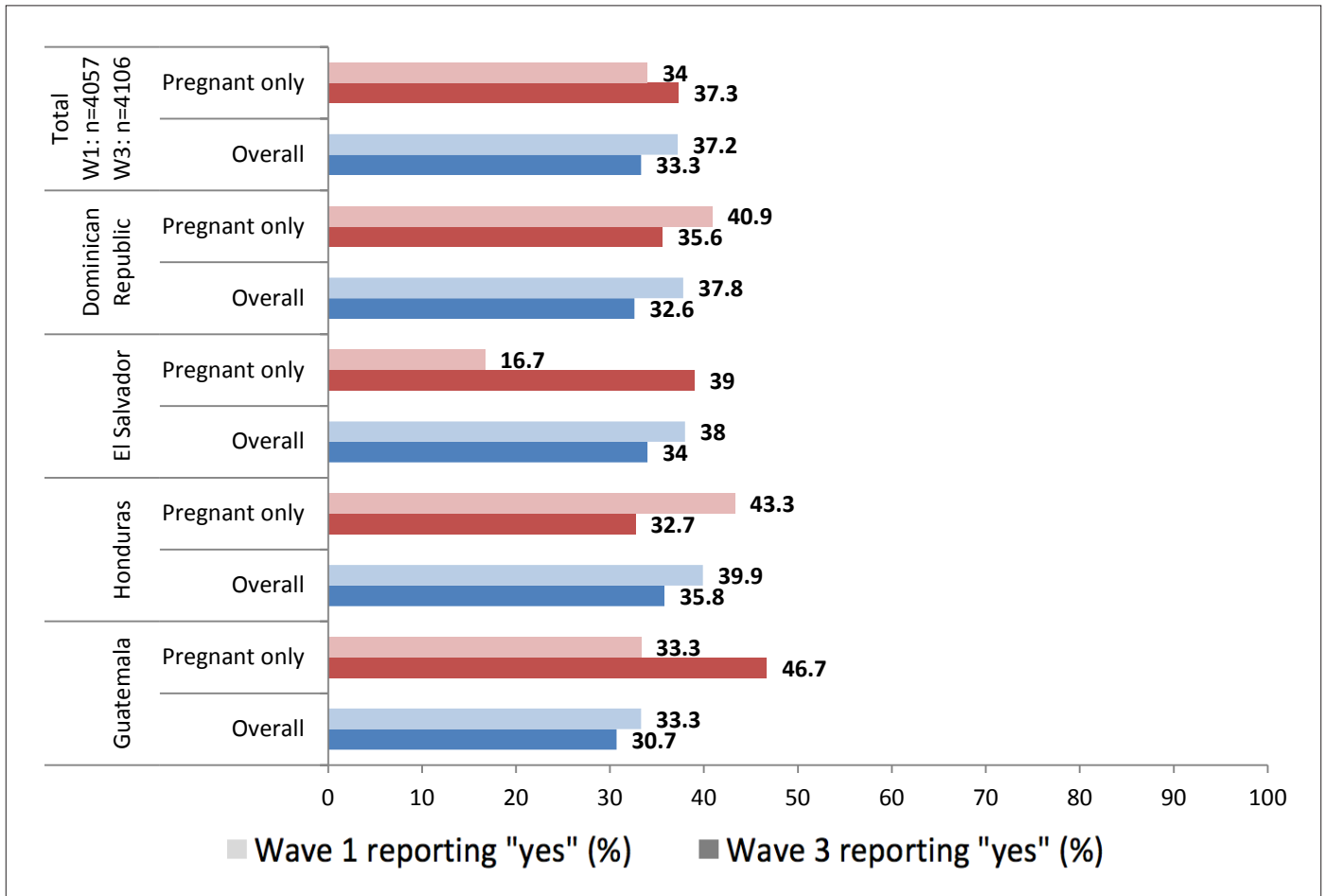
About one third of women (32.5%) and men (34.1%) reported that a person can get Zika through sex in wave 3. While percent knowledge of sexual transmission of Zika was lower among men and women in the Dominican Republic, El Salvador, and Honduras and for men in Guatemala in wave 3 as compared to wave 1. An increase from 24.7% to 32.3% was observed among women in Guatemala.

Figure 1. Percentage of participants who reported that a person can get Zika through sex (wave 1 vs. wave 3), by gender



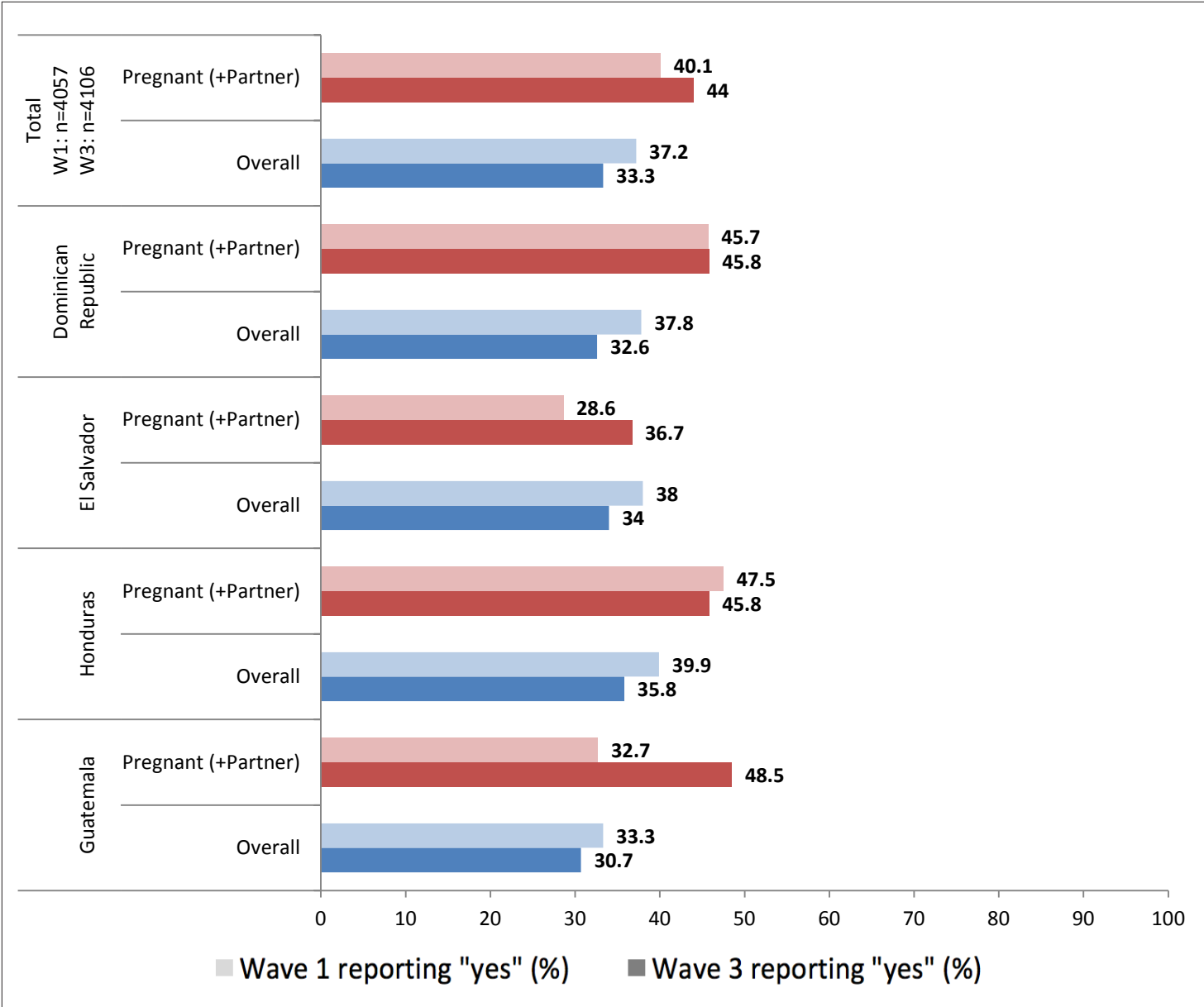
The percentage of pregnant women with knowledge that Zika can be transmitted sexually was higher overall in wave 3 (37.3%) than in wave 1 (34.0%). In particular, in El Salvador and Guatemala, a larger percentage of pregnant women in wave 3 had knowledge that a person can get Zika through sex than among pregnant women in wave 1.

Figure 2. Percentage of pregnant women who reported that a person can get Zika through sex (wave 1 vs. wave 3), by pregnancy status



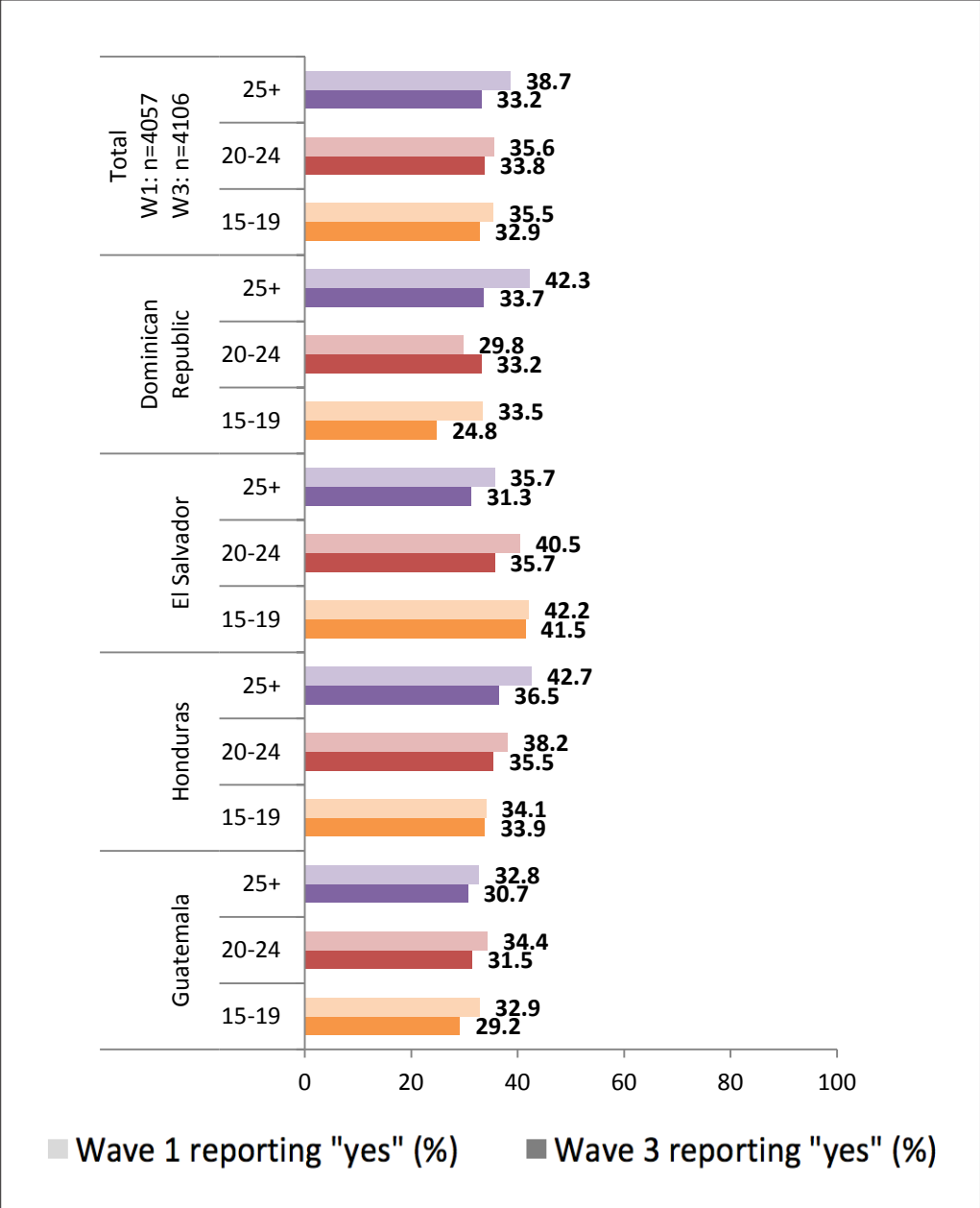
Among pregnant women survey respondents and male survey respondents whose partners were currently pregnant, percent knowledge of sexual transmission was similarly higher in wave 3 than in wave 1 in El Salvador and Guatemala. Percentage of participants reporting knowledge of sexual transmission was similar for pregnant women and men whose partners were pregnant in the Dominican Republic in wave 1 and wave 3 (45.7% and 45.8% respectively).

Figure 3. Percentage of participants who reported that a person can get Zika through sex (wave 1 vs. wave 3), pregnant women respondents and male respondents whose partner is pregnant



Overall, knowledge of sexual transmission of Zika was similar across age groups. While the lowest percentage of adolescents reporting such knowledge were from the Dominican Republic (24.8%), Honduras (33.9%), and Guatemala (29.2%), the highest proportion of adolescents who correctly reported that a person can get Zika through sex were in El Salvador (41.5%).

Figure 4. Percentage of participants who reported that a person can get Zika through sex (wave 1 vs. wave 3), by age

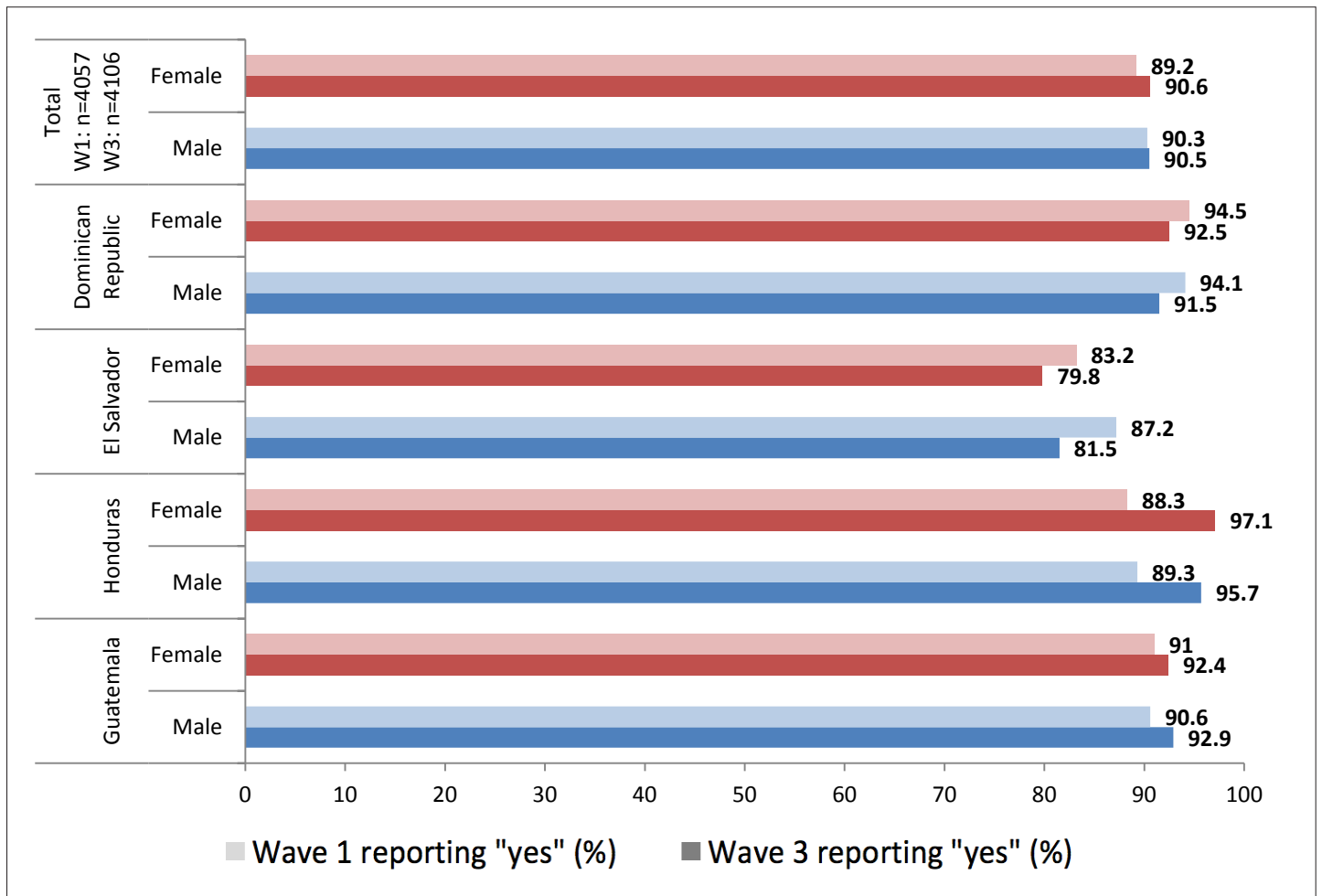


Knowledge that a person can get Zika from a mosquito bite

There was no statistically significant difference overall in knowledge that a person can get Zika from a mosquito bite between wave 1 and wave 3.

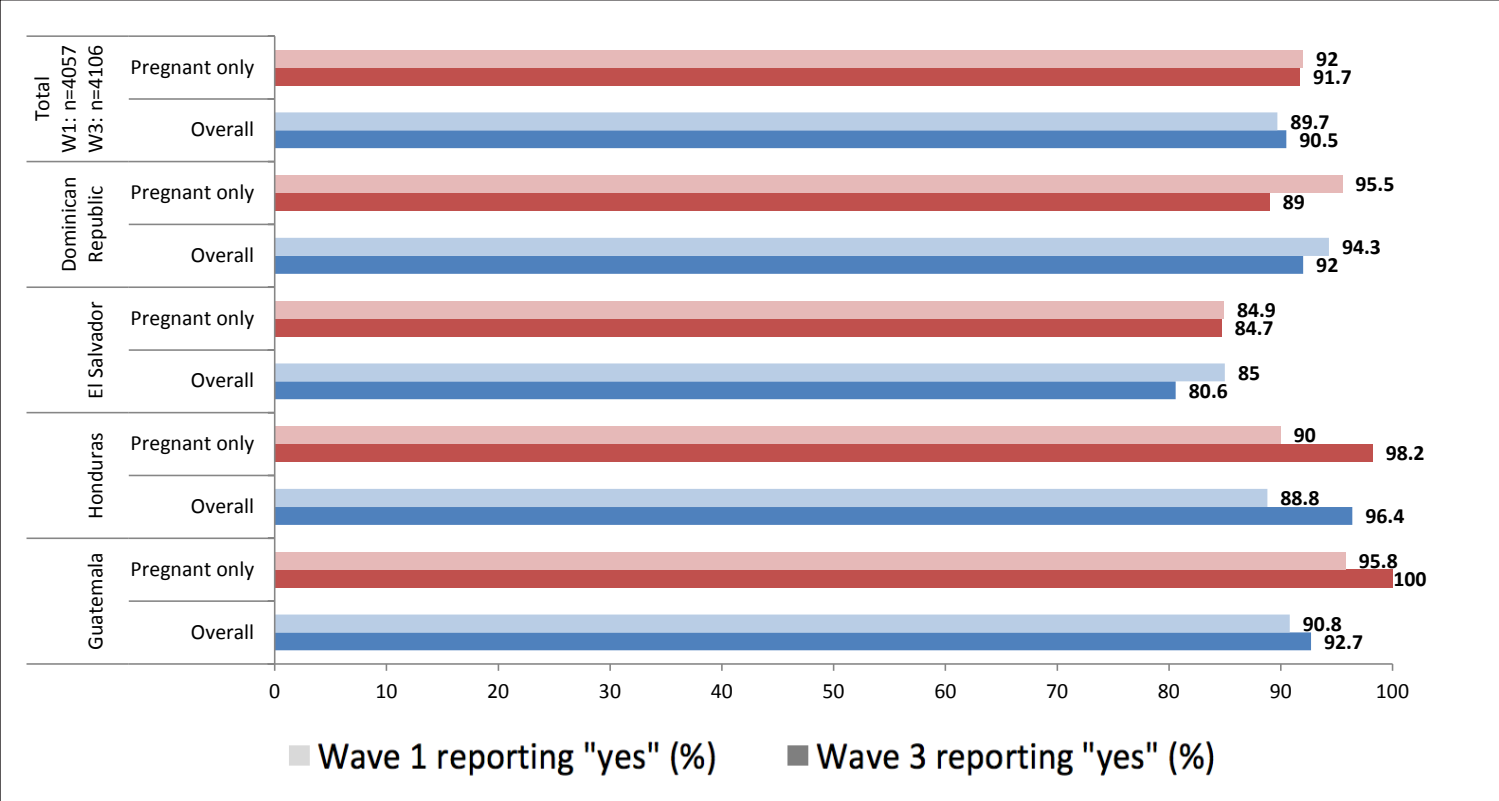
Overall, the percentages of women and men who reported knowledge that mosquitos can transmit Zika were slightly higher in wave 3 as compared to wave 1. There were variations by country, with larger percentages of women and men in Honduras and Guatemala in wave 3 reporting knowledge of Zika transmission from mosquitoes than in wave 1; this was not observed for women and men in the Dominican Republic or El Salvador.

Figure 5. Percentage of participants who reported that a person can get Zika from a mosquito bite (wave 1 vs. wave 3), by gender



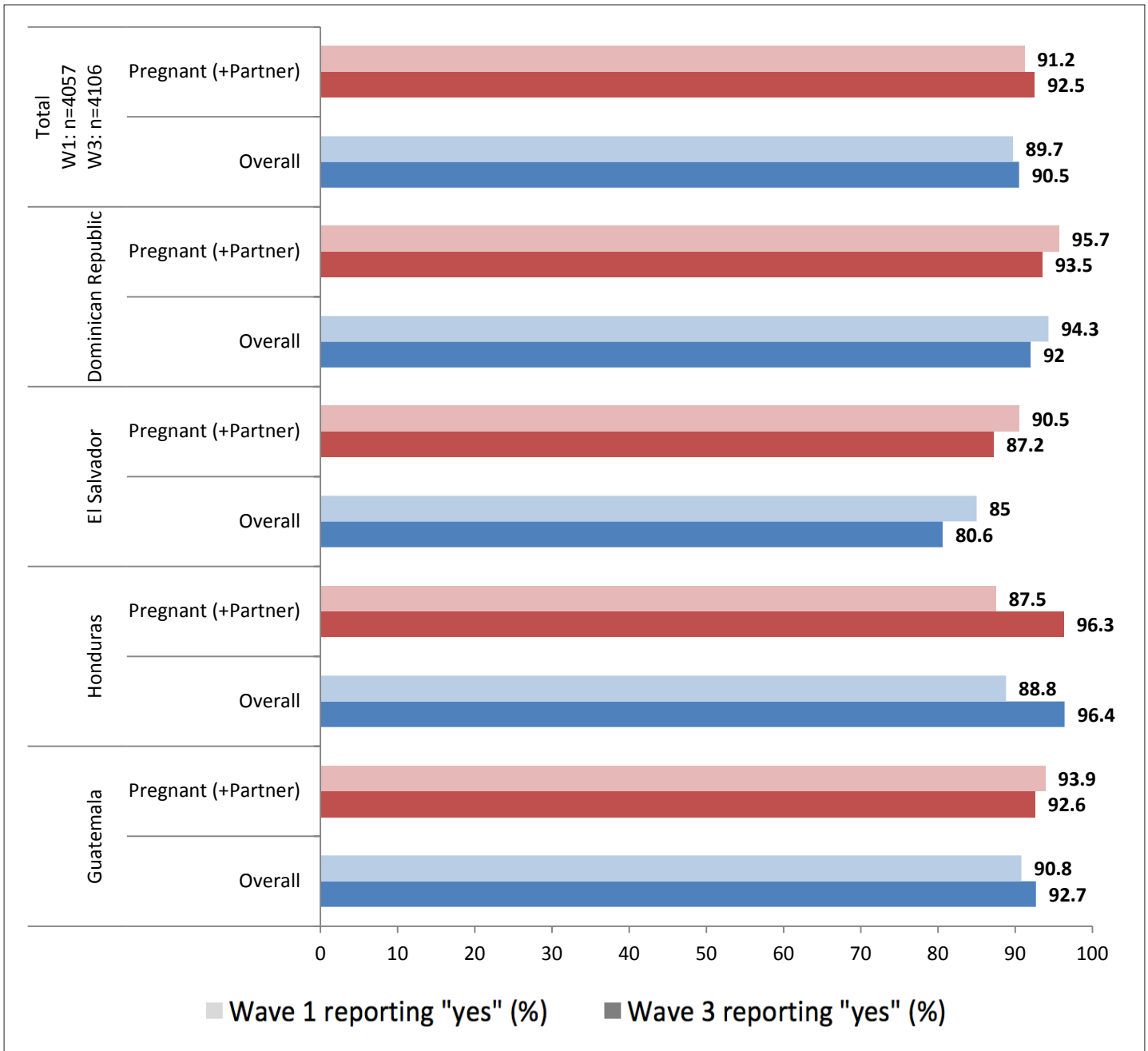
Overall, the percentages of pregnant women reporting knowledge of mosquito-related transmission of Zika were similar between wave 1 and wave 3. A larger percentage of pregnant women in Honduras and Guatemala had knowledge of mosquito transmission in wave 3 (98.2% and 100% respectively) than in wave 1.

Figure 6. Percentage of participants who reported that a person can get Zika from a mosquito bite (wave 1 vs. wave 3), by pregnancy status



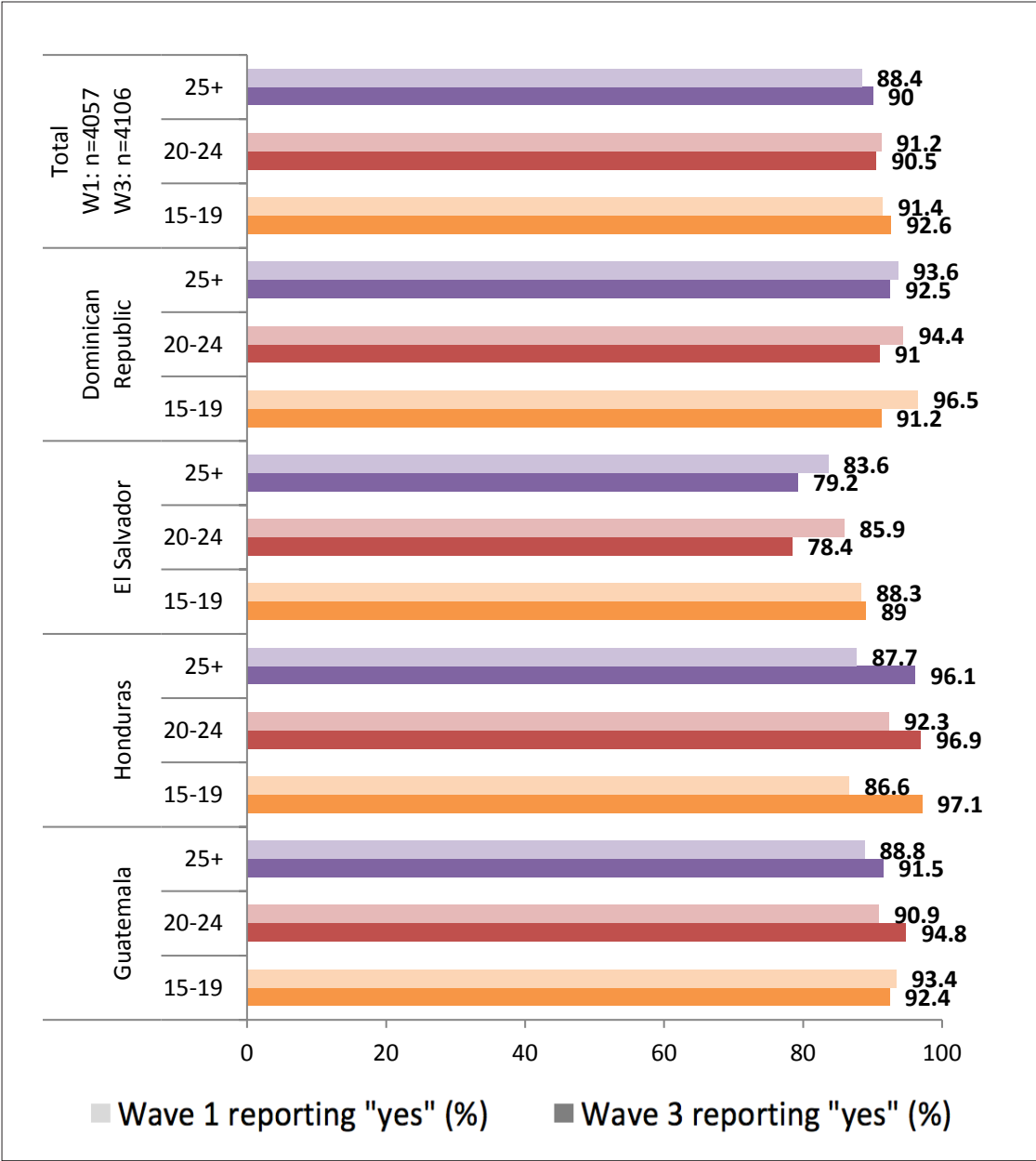
It was also found that similar proportions of pregnant women and male respondents whose partners were pregnant at the time of the survey had correct knowledge of mosquito transmission of Zika in wave 1 and wave 3. Honduras was the only country where a higher percentage of this sub-group of participants had correct knowledge that a person can get Zika from a mosquito bite in wave 3 (96.3%) as compared to wave 1 (87.5%).

Figure 7. Percentage of participants who reported that a person can get Zika from a mosquito bite (wave 1 vs. wave 3), by pregnancy/pregnant partner status



Knowledge of mosquito transmission by age showed that while overall there was little difference in the percentage of participants who reported that a person can get Zika from a mosquito bite from wave 1 to wave 3, there were differences between age groups when looking at individual countries. In El Salvador, percent with correct knowledge of mosquito transmission was higher among adolescents (wave 3: 89.0%) than among other age groups, while in other countries differences were less pronounced.

Figure 8. Percentage of participants who reported that a person can get Zika from a mosquito bite (wave 1 vs. wave 3), by age

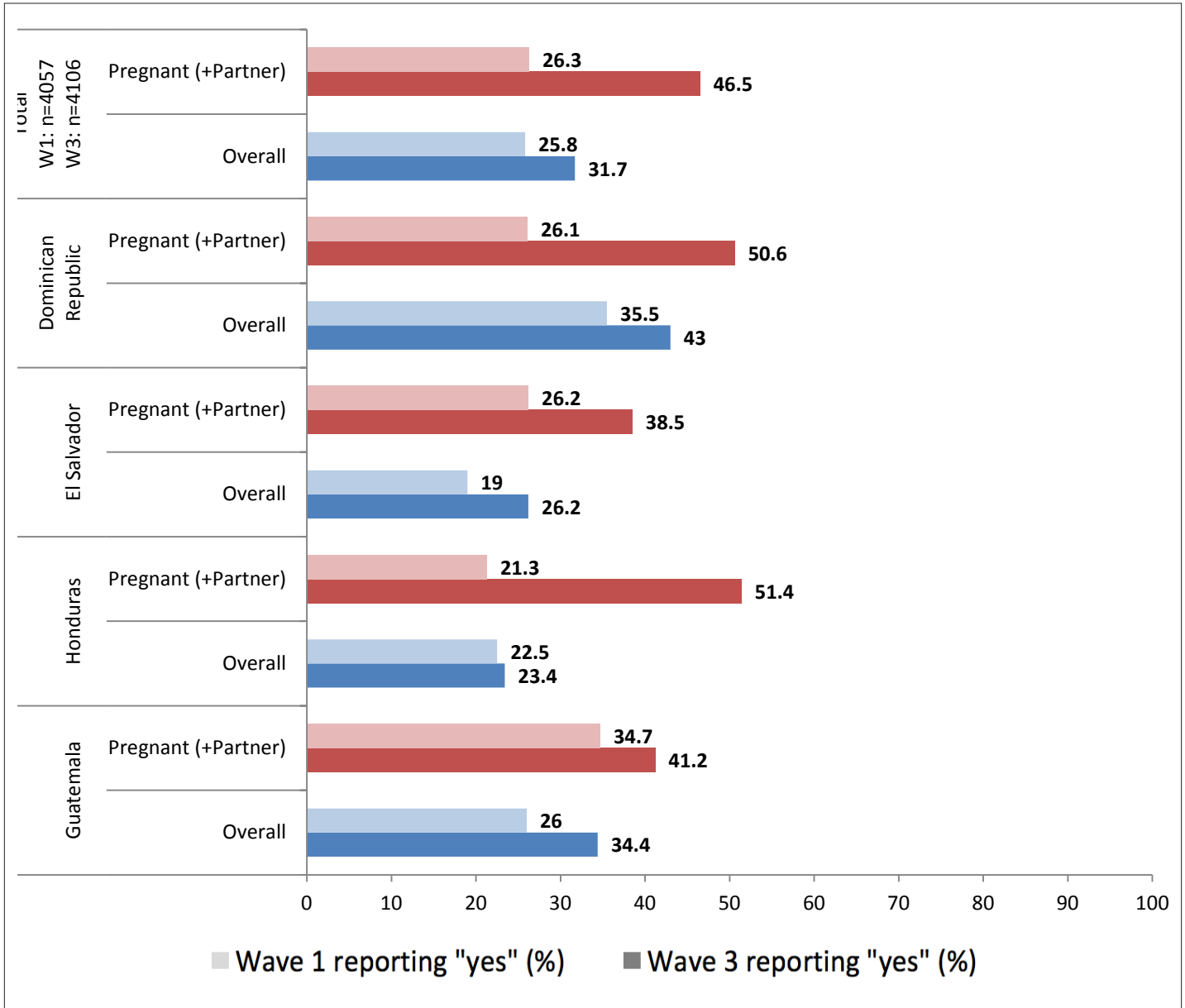


Knowledge that a pregnant woman with Zika could have a miscarriage

Overall and across all countries, a higher percentage of women and men in wave 3 had knowledge that a pregnant woman with Zika could have a miscarriage as compared to wave 1. These differences were significant at the aggregate level ($p < 0.0001$) as well as in all countries ($p < 0.001$) except for Honduras ($p = 0.628$).

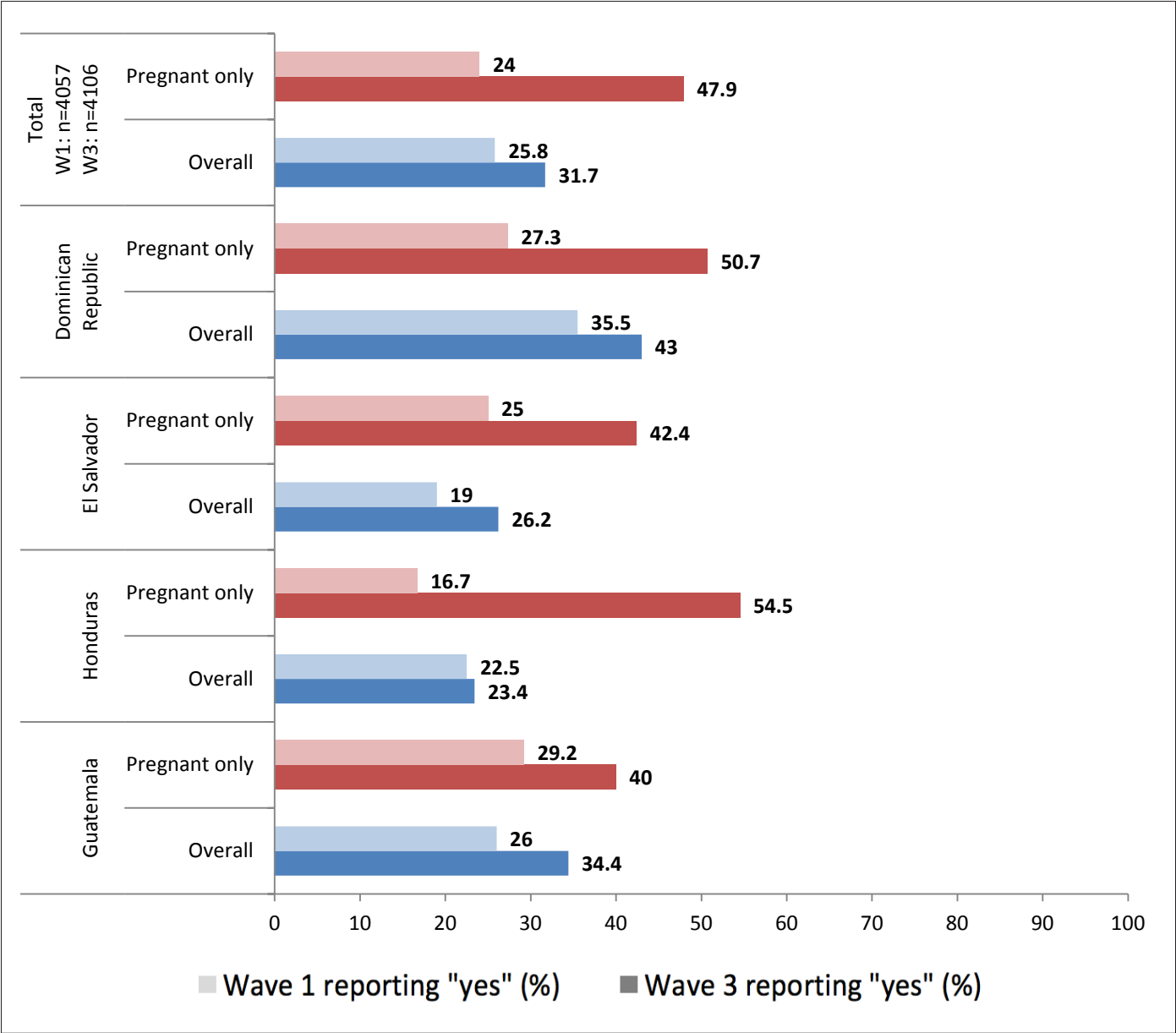
In wave 3, a larger percentage of women than men had knowledge of this potential effect of Zika (34.5% vs. 28.7%).

Figure 9. Percentage of participants who reported that a pregnant woman with Zika could have a miscarriage (wave 1 vs. wave 3), by gender



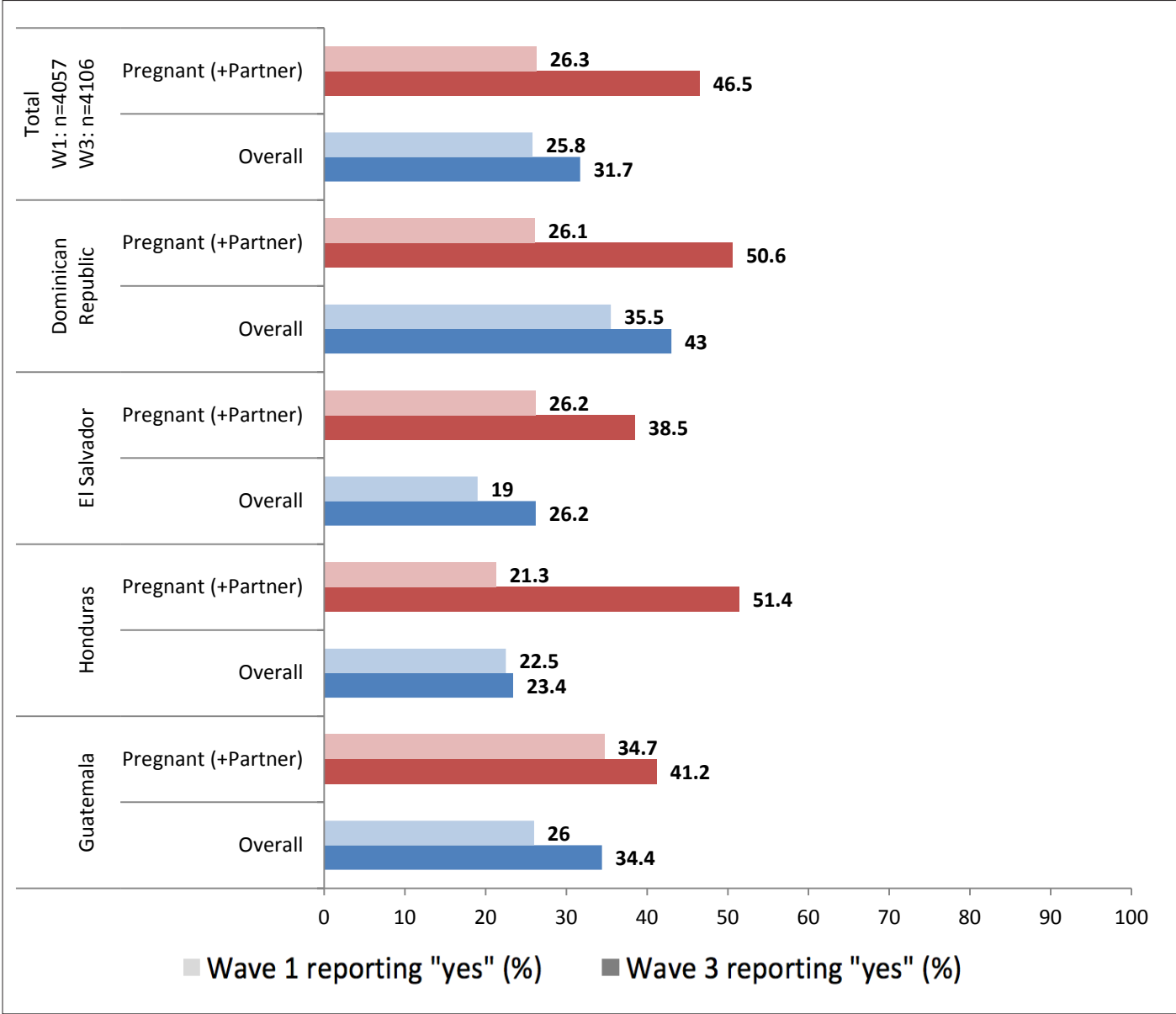
Disaggregation by pregnancy status showed that a larger percentage of currently pregnant women who were pregnant at the time of the survey had knowledge of the risk of miscarriage in wave 3 as compared to wave 1 (47.9% vs. 24.0%). These differences were observed across all four countries.

Figure 10. Percentage of participants who reported that a pregnant woman with Zika could have a miscarriage (wave 1 vs. wave 3), by pregnancy status



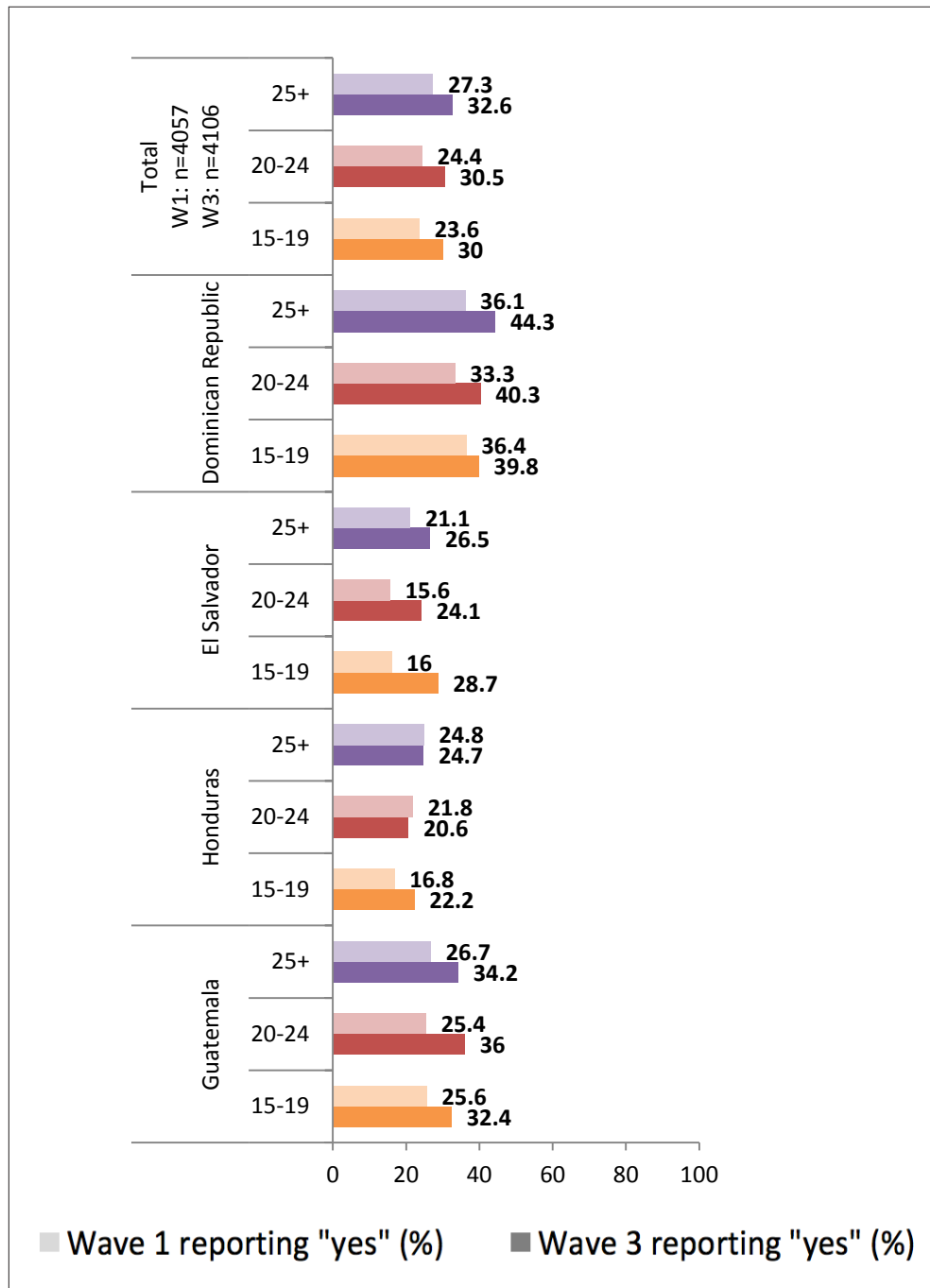
Similarly, a higher percentage of pregnant women and males whose partners were pregnant at the time of the survey reported knowledge of the risk of miscarriage with Zika in wave 3 as compared to wave 1. This increase was particularly apparent in Honduras, where percent knowledge increased from 21.3% in wave 1 to 51.4% in wave 3.

Figure 11. Percentage of participants who reported that a pregnant woman with Zika could have a miscarriage (wave 1 vs. wave 3), by pregnancy/pregnant partner status



A higher percent knowledge of miscarriage as a potential effect of Zika was reported by adolescents, youth, and adults 25 years of age and older Zika in wave 3 than in wave 1. In the Dominican Republic and Honduras, a larger percentage of adults had such knowledge than younger participants in wave 3 (44.3% and 24.7% respectively), but this was not consistent for other countries.

Figure 12. Percentage of participants who reported that a pregnant woman with Zika could have a miscarriage (wave 1 vs. wave 3), by age

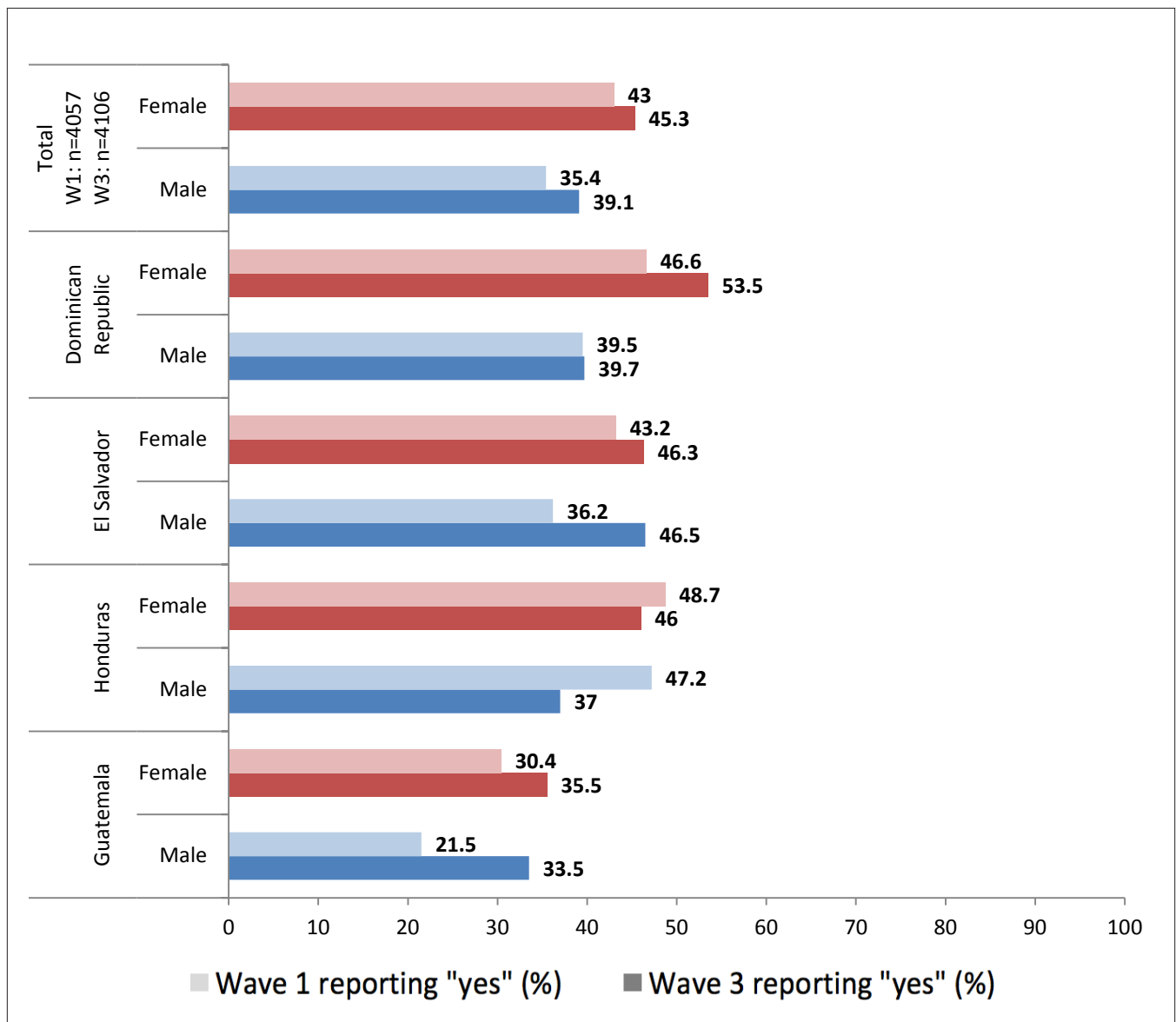


Knowledge that a pregnant woman with Zika could have a baby with microcephaly

Overall, the percent of participants reporting knowledge that a pregnant woman with Zika could have a baby with microcephaly was significantly higher in wave 3 than in wave 1 overall as well as in El Salvador, and Guatemala ($p < 0.01$). Although there were increases in Dominican Republic, it was not a significant change ($p = 0.1464$).

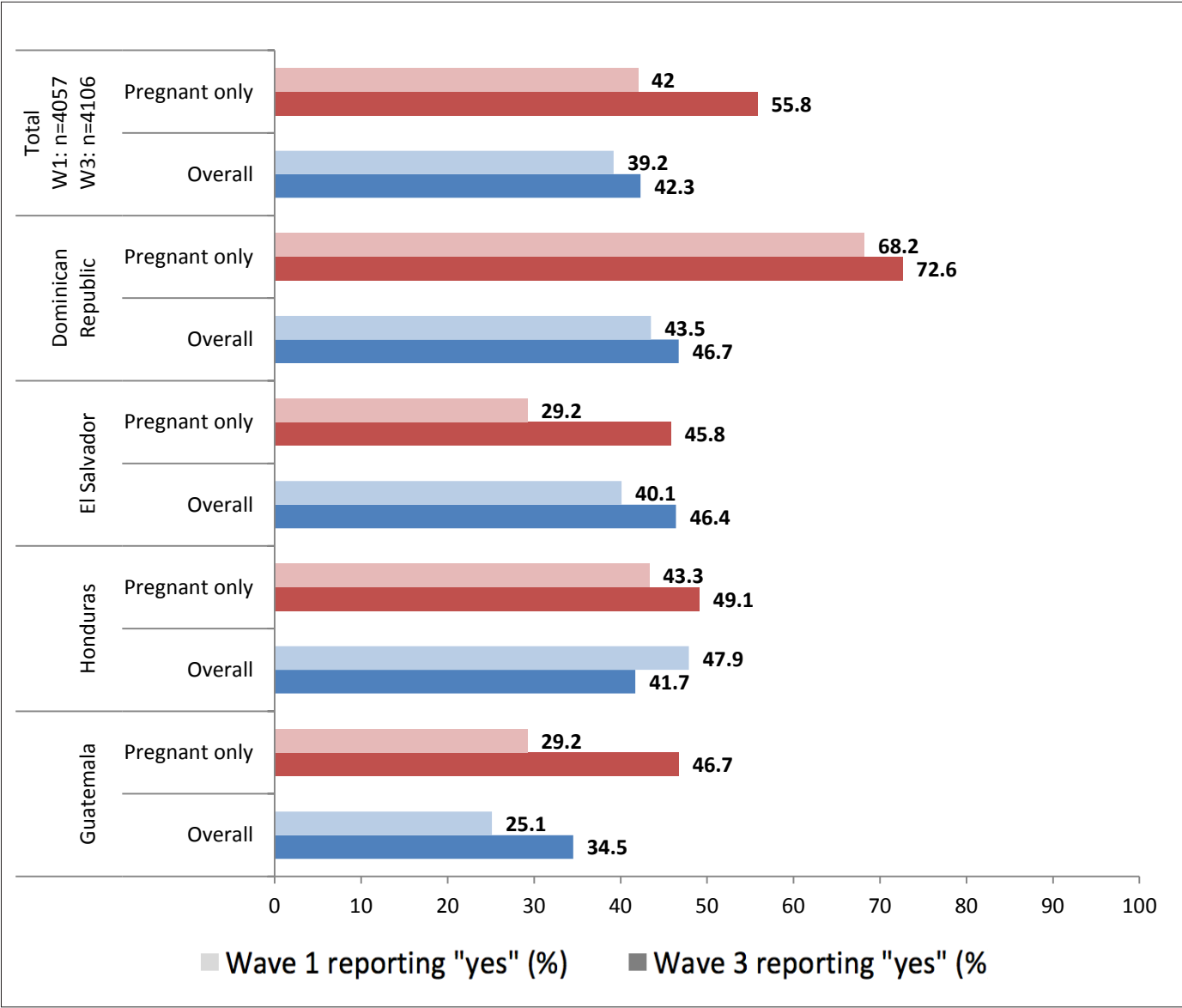
In nearly all countries, a larger percentage of women and men in wave 3 as compared to wave 1 had knowledge that a pregnant woman with Zika could have a baby with a small head. Overall, more women (45.3%) in wave 3 reported such knowledge than men (39.1%).

Figure 13. Percentage of participants who reported that a pregnant woman with Zika could have a baby with a small head (wave 1 vs. wave 3), by gender



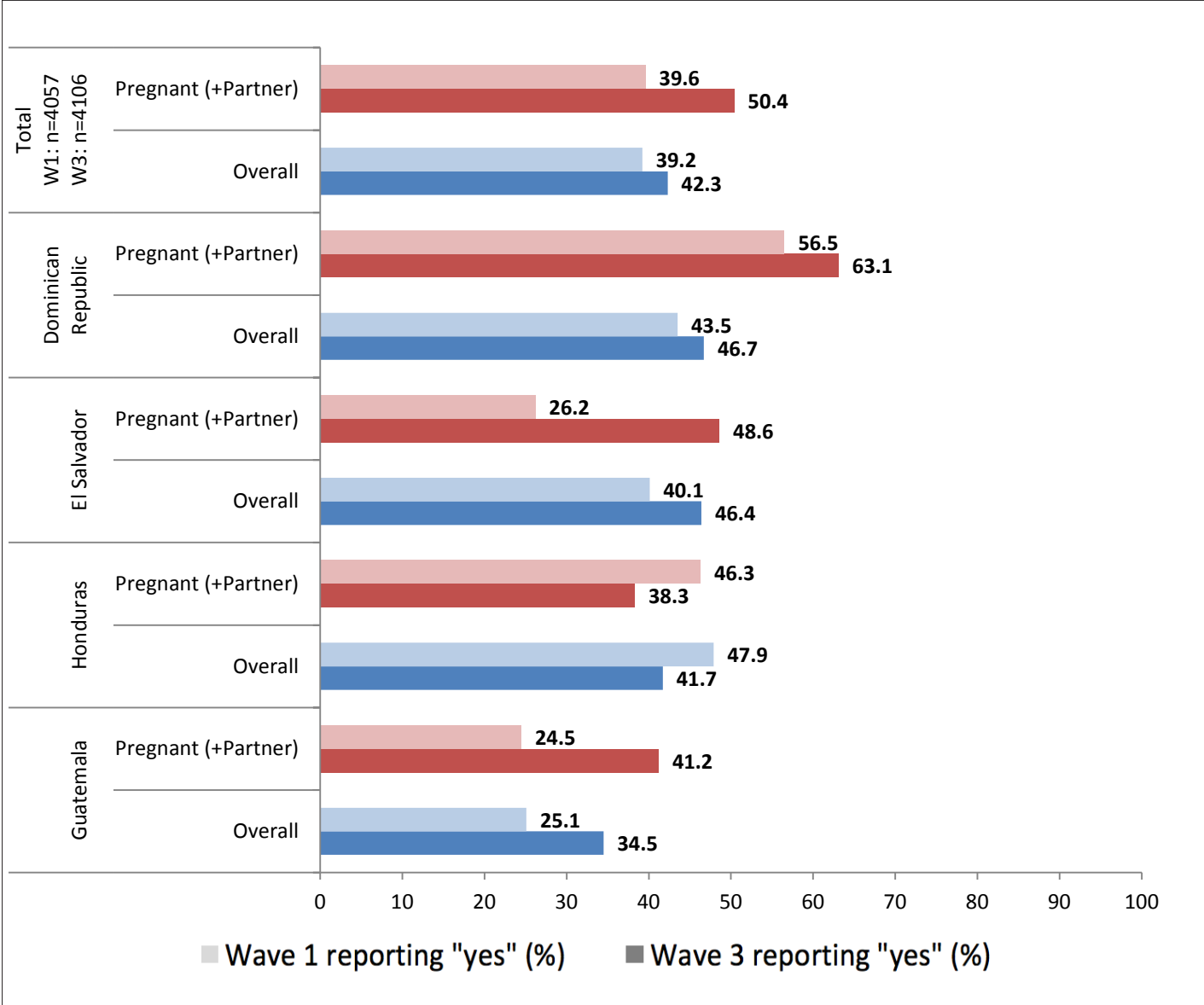
More pregnant participants had high knowledge of the risk of microcephaly as compared to the overall group of participants both in the full sample and in the Dominican Republic, Honduras, and Guatemala. In the Dominican Republic, nearly three quarters (72.6%) of pregnant women reported correctly that a pregnant woman with Zika could have a baby with a small head as compared to less than half (48.7%) of participants from the Dominican Republic.

Figure 14. Percentage of participants who reported that a pregnant woman with Zika could have a baby with a small head (wave 1 vs. wave 3), by pregnancy status



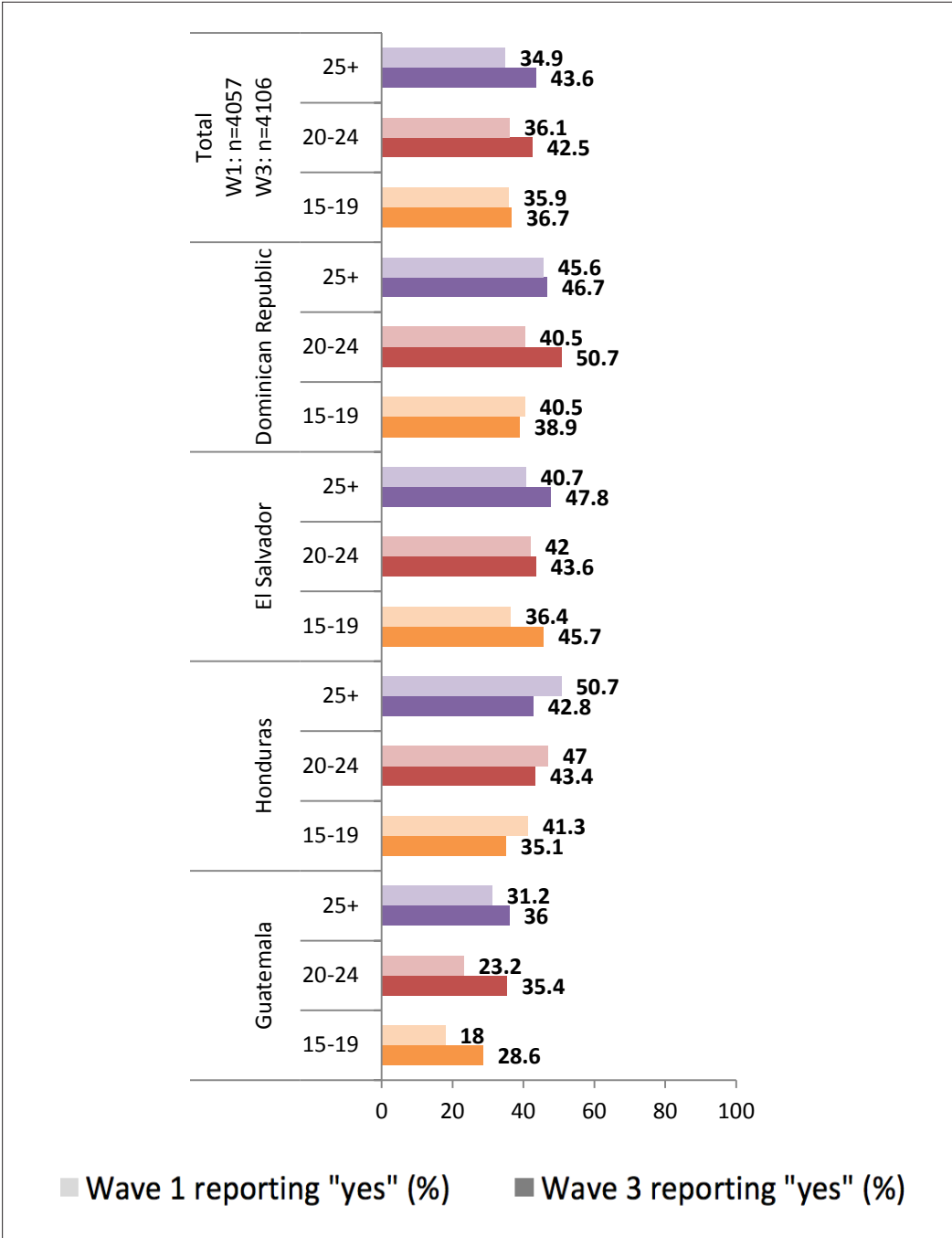
A larger percentage of pregnant participants and males whose partners were pregnant at the time of the survey had correct knowledge of the risk of microcephaly in wave 3 as compared to wave 1. In El Salvador, the percent with this knowledge increased from slightly more than one quarter (26.2%) to nearly half (48.6%) from wave 1 to wave 3. The opposite trend was observed in Honduras comparing wave 3 to wave 1.

Figure 15. Percentage of participants who reported that a pregnant woman with Zika could have a baby with a small head (wave 1 vs. wave 3), by pregnancy/pregnant partner status



The percentage of adolescents reporting knowledge of the risk of microcephaly with Zika was higher (36.7%) than that of youth (42.5%) and adults 25 and older (43.6%) in wave 3 as compared to wave 1. Except in Honduras, adults 25 years and older had the largest percentage of participants who reported knowledge of the risk of microcephaly as compared to other age groups. Similarly, adolescents had the lowest percentage of participants who reported knowledge of the risk of microcephaly in wave 3 as compared to other age groups.

Figure 16. Percentage of participants who reported that a pregnant woman with Zika could have a baby with a small head (wave 1 vs. wave 3), by age

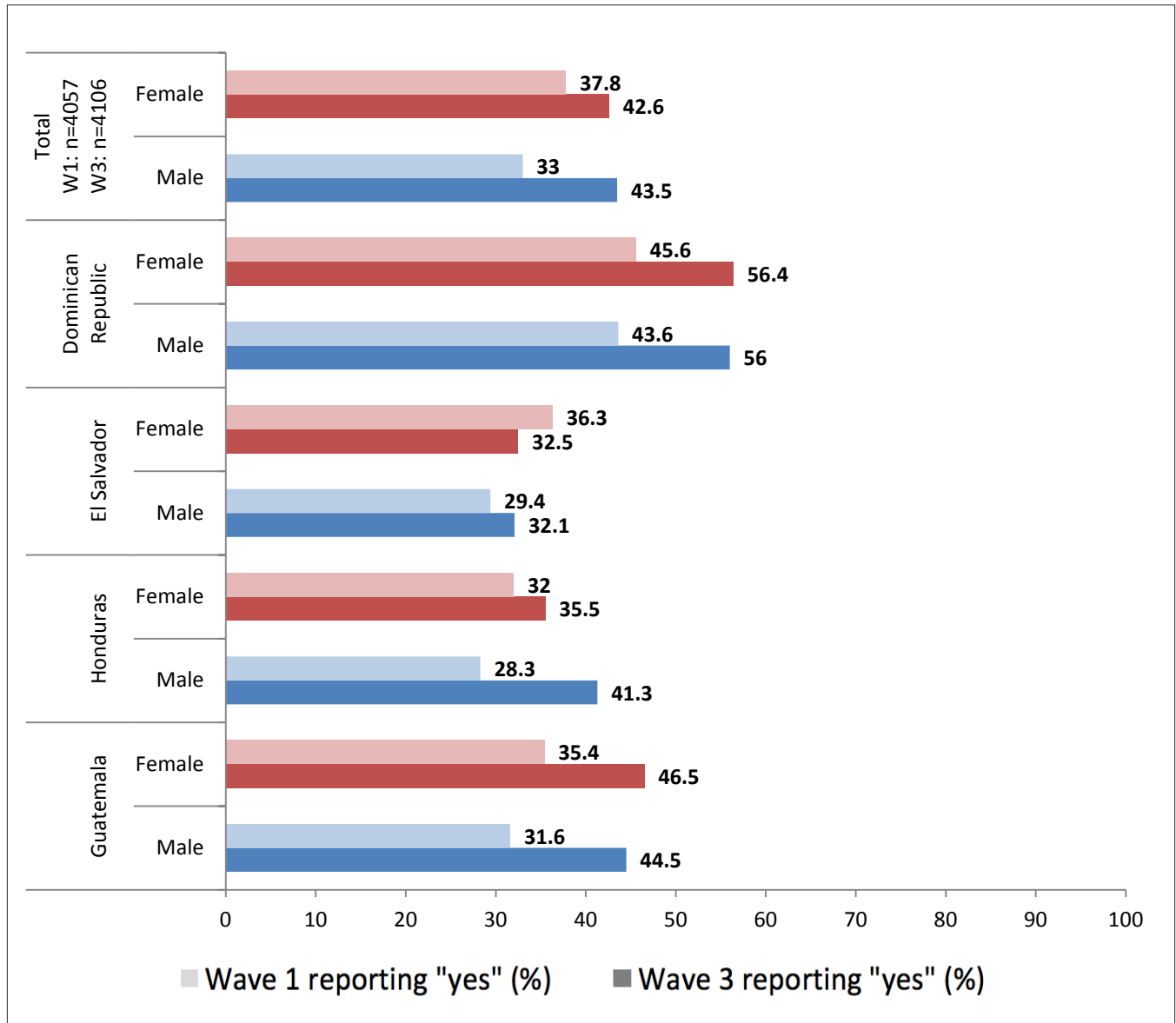


Knowledge that a pregnant woman with Zika could have a baby with disabilities

The percentage of participants reporting knowledge that a pregnant woman with Zika could have a baby with disabilities was significantly higher in wave 3 than in wave 1 ($p < 0.001$) except in El Salvador ($p = 0.6651$).

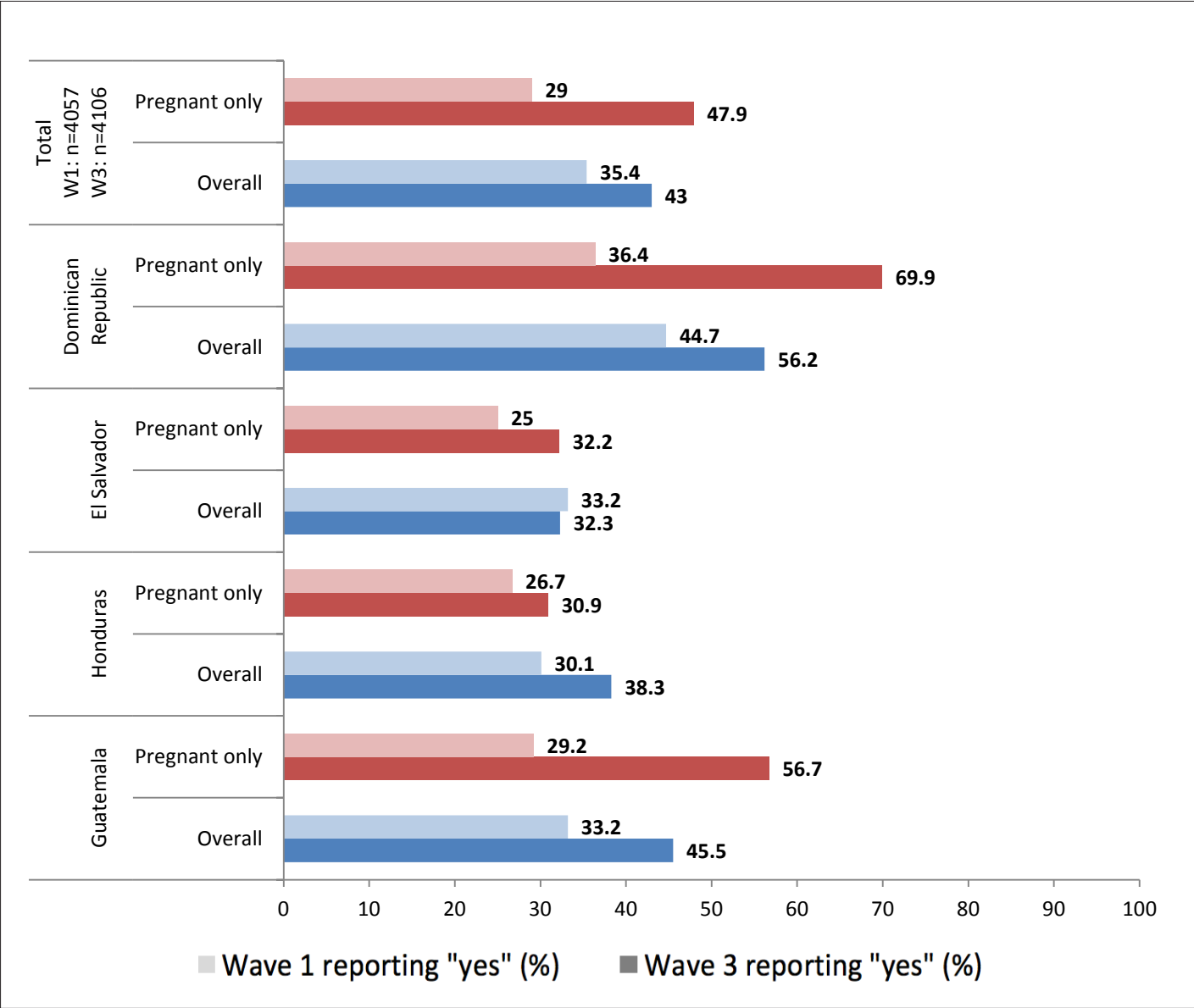
The percentage of participants reporting knowledge that a pregnant woman with Zika could have a baby with disabilities was also higher among women and men in wave 3 (42.6% and 43.5% respectively) than in wave 1 (37.8% and 33%).

Figure 17. Percentage of participants who reported that a pregnant woman with Zika could have a baby with disabilities (wave 1 vs. wave 3), by gender



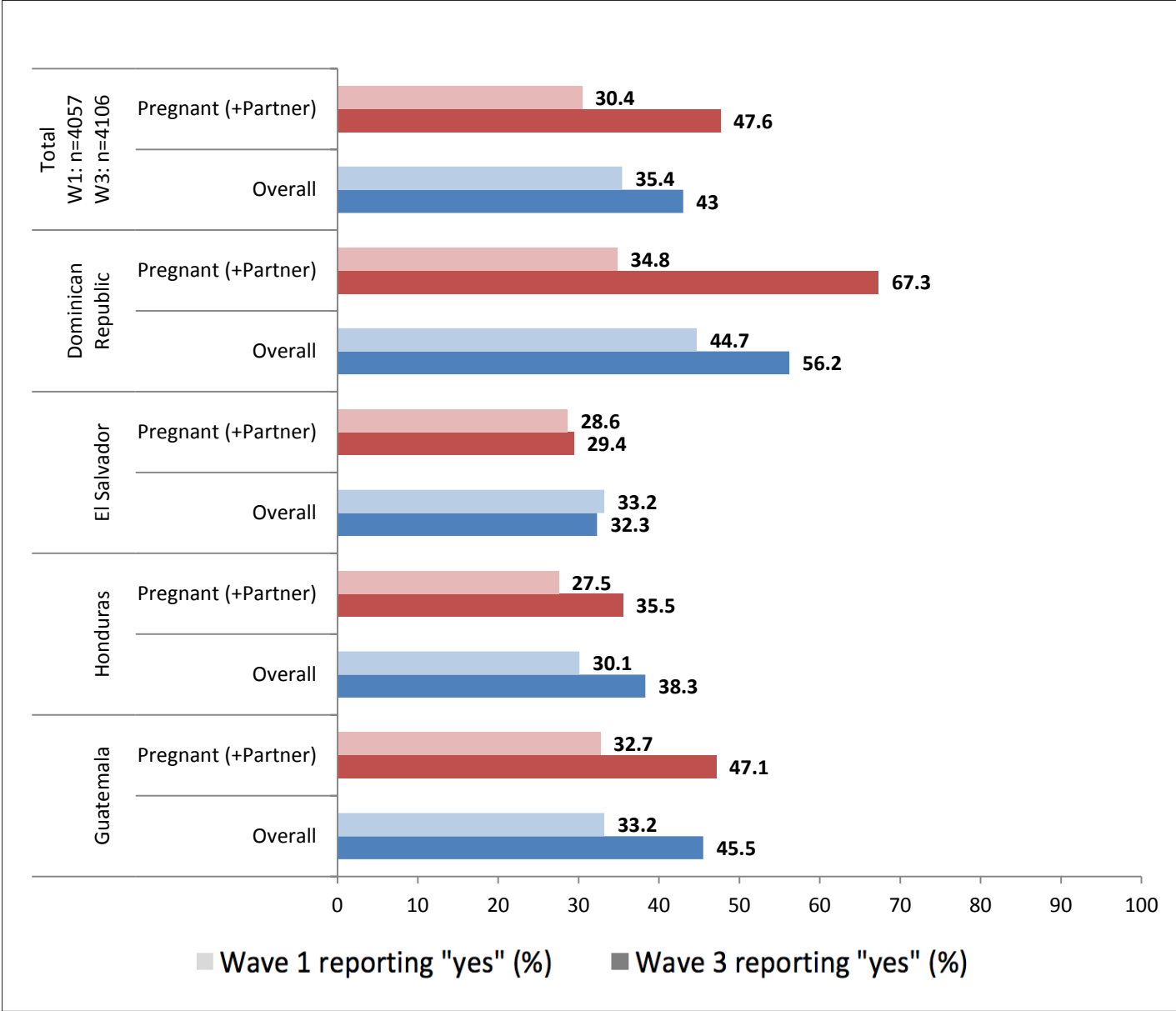
A larger percentage of currently pregnant women had knowledge that a pregnant woman with Zika could have a baby with disabilities than the overall population in all countries. A larger percentage of pregnant women had knowledge of this effect of Zika in wave 3 than in wave 1 in all countries. Across all countries, pregnant women in the Dominican Republic had the highest percentage of participants reporting knowledge of the risk that a pregnant woman with Zika could have a baby with disabilities (wave 3: 72.6%).

Figure 18. Percentage of participants who reported that a pregnant woman with Zika could have a baby with disabilities (wave 1 vs. wave 3), by pregnancy status



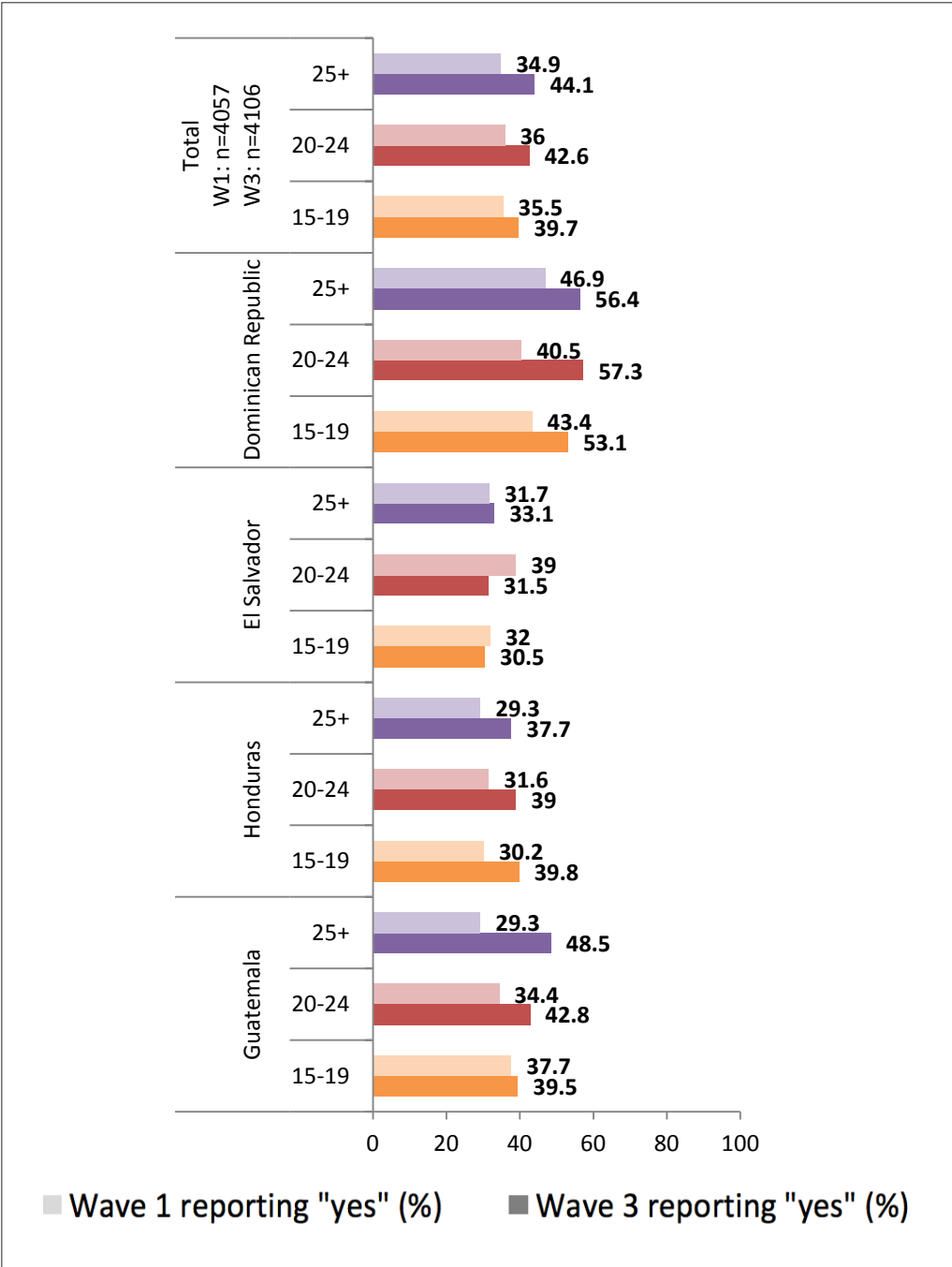
Similarly, more pregnant women and males whose partners were pregnant at the time of the survey reported that a pregnant woman with Zika could have a baby with disabilities more often in wave 3 than in wave 1. This difference was larger in the Dominican Republic, Honduras, and Guatemala than it was in El Salvador.

Figure 19. Percentage of participants who reported that a pregnant woman with Zika could have a baby with disabilities (wave 1 vs. wave 3), by pregnancy/pregnant partner status



Overall and in Guatemala, a larger percentage of adults reported knowledge of the risk of having a baby with disabilities with Zika (wave 3: 44.1% and 48.5% respectively) than did other age groups, but this trend differed in the Dominican Republic, El Salvador, and Honduras. Across all age groups, the percentage of participants reporting knowledge that a pregnant woman with Zika could have a baby with disabilities was higher in wave 3 than in wave 1 in all countries except El Salvador.

Figure 20. Percentage of participants who reported that a pregnant woman with Zika could have a baby with disabilities (wave 1 vs. wave 3), by age

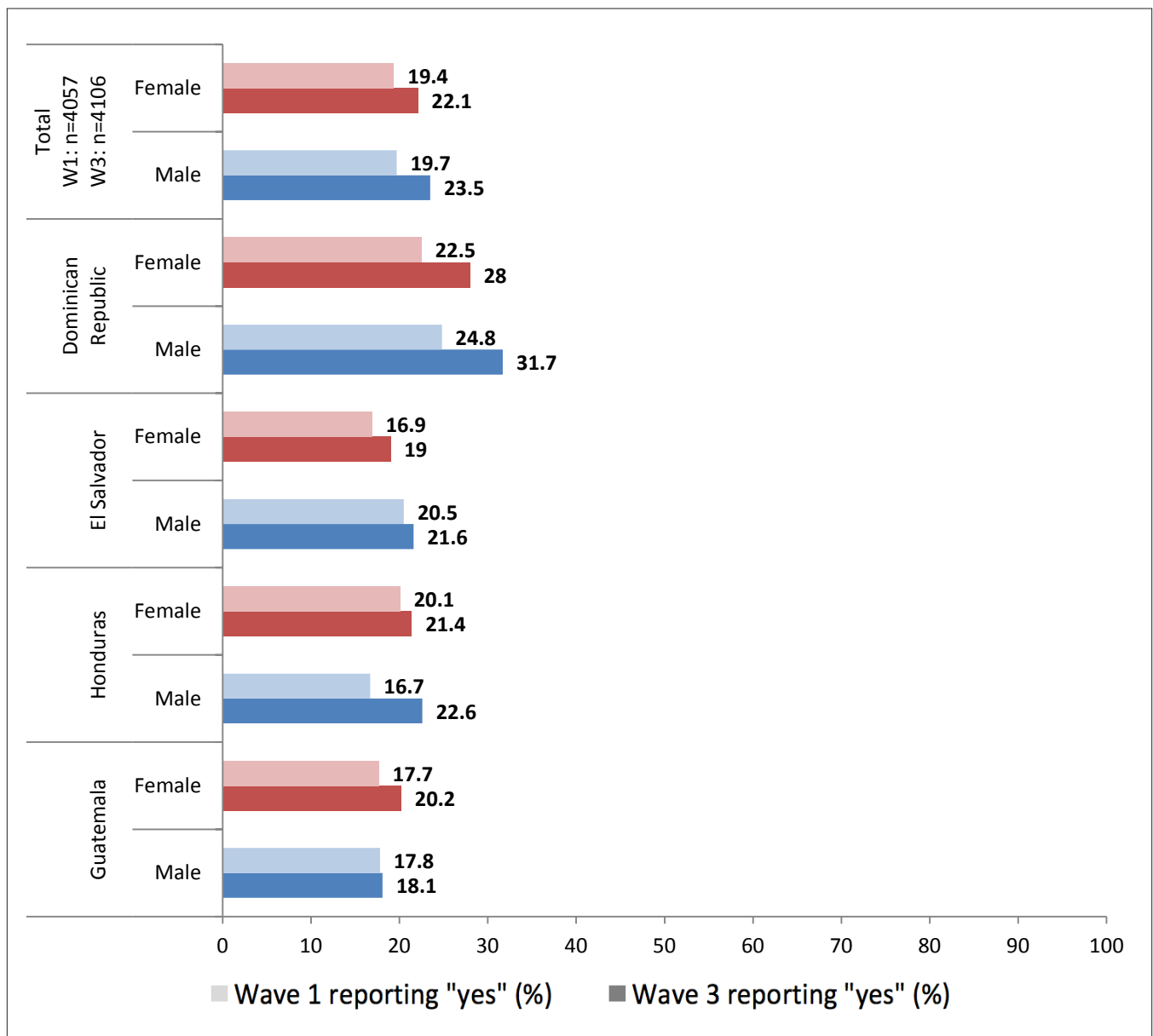


Knowledge that most people with Zika will not have any symptoms

While overall there were differences in reported knowledge between wave 1 and wave 3, analyses by country showed that only in the Dominican Republic and Honduras was the percentage with correct knowledge of Zika’s asymptomatic nature significantly higher in wave 3 as compared to wave 1 (p=0.0013 and p=0.037 respectively).

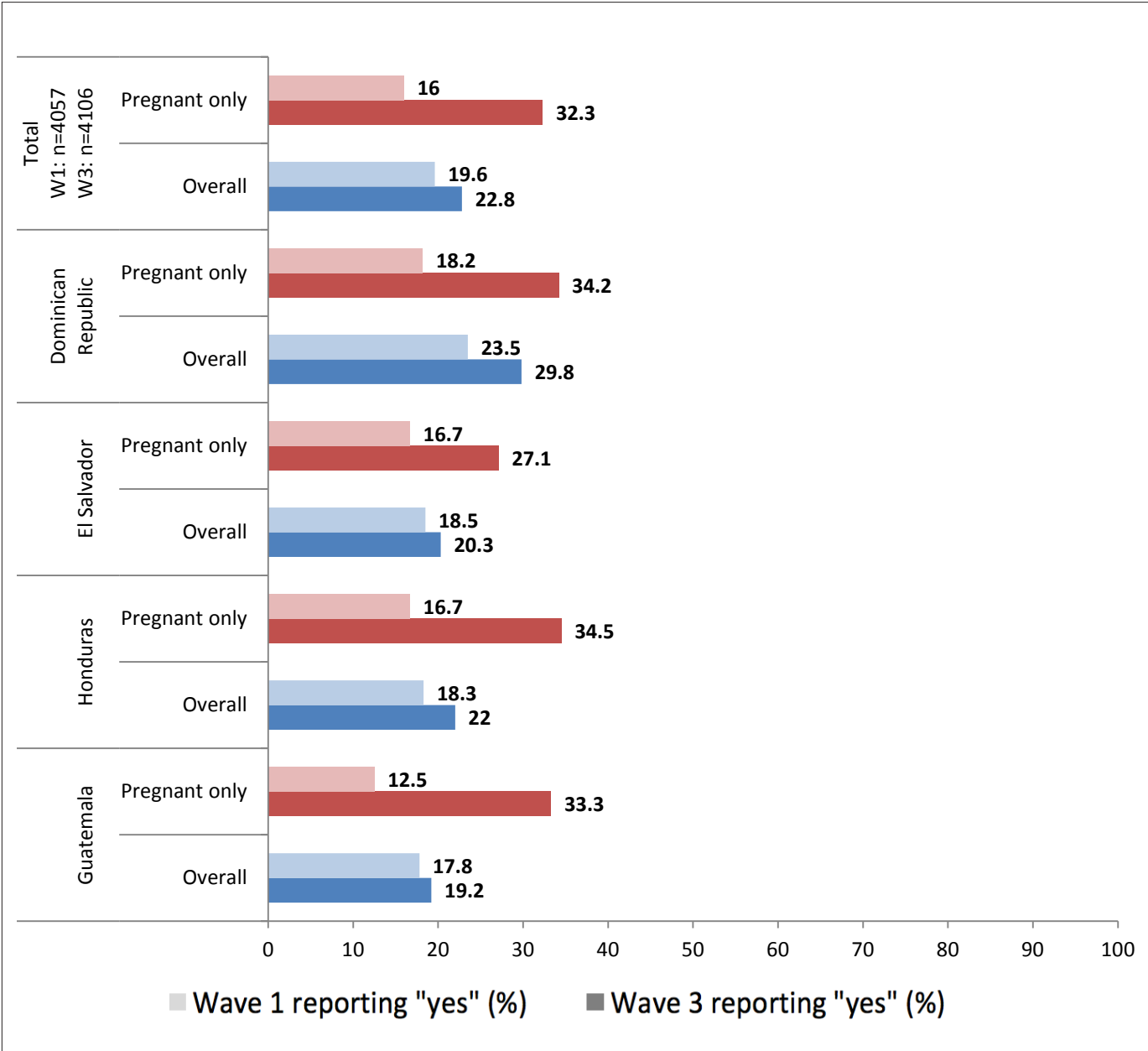
Less than one quarter of women (22.1%) and men (23.5%) in wave 3 reported that most people with Zika will not have any symptoms. For both men and women in all four countries, a larger percentage of participants reported such knowledge in wave 3 than in wave 1. A larger percentage of men in the Dominican Republic, El Salvador, and Honduras had knowledge that most people with Zika will not have any symptoms as compared to women in wave 3.

Figure 21. Percentage of participants who reported that most people with Zika will not have any symptoms (wave 1 vs. wave 3), by gender



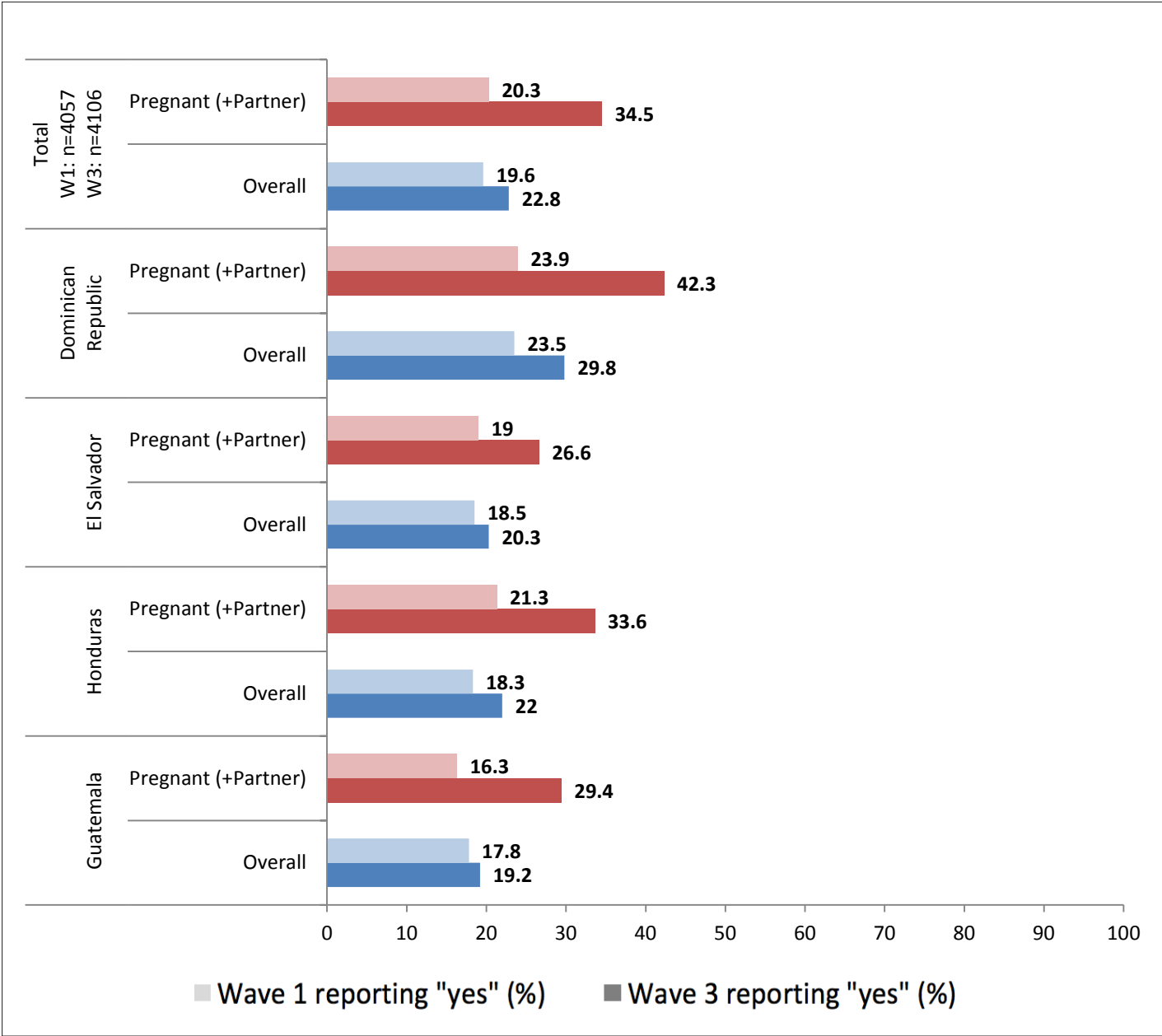
Among women who were pregnant at the time of the survey, the percentage of participants reporting knowledge that most people with Zika will not have any symptoms increased from 16% in wave 1 to 32.3% in wave 3. This difference was more pronounced than the overall differences observed for the full sample. In Guatemala, the percentage of participants reporting such knowledge increased from 12.5% in wave 1 to one third of participants (33.3%) in wave 3.

Figure 22. Percentage of participants who reported that most people with Zika will not have any symptoms (wave 1 vs. wave 3), by pregnancy status



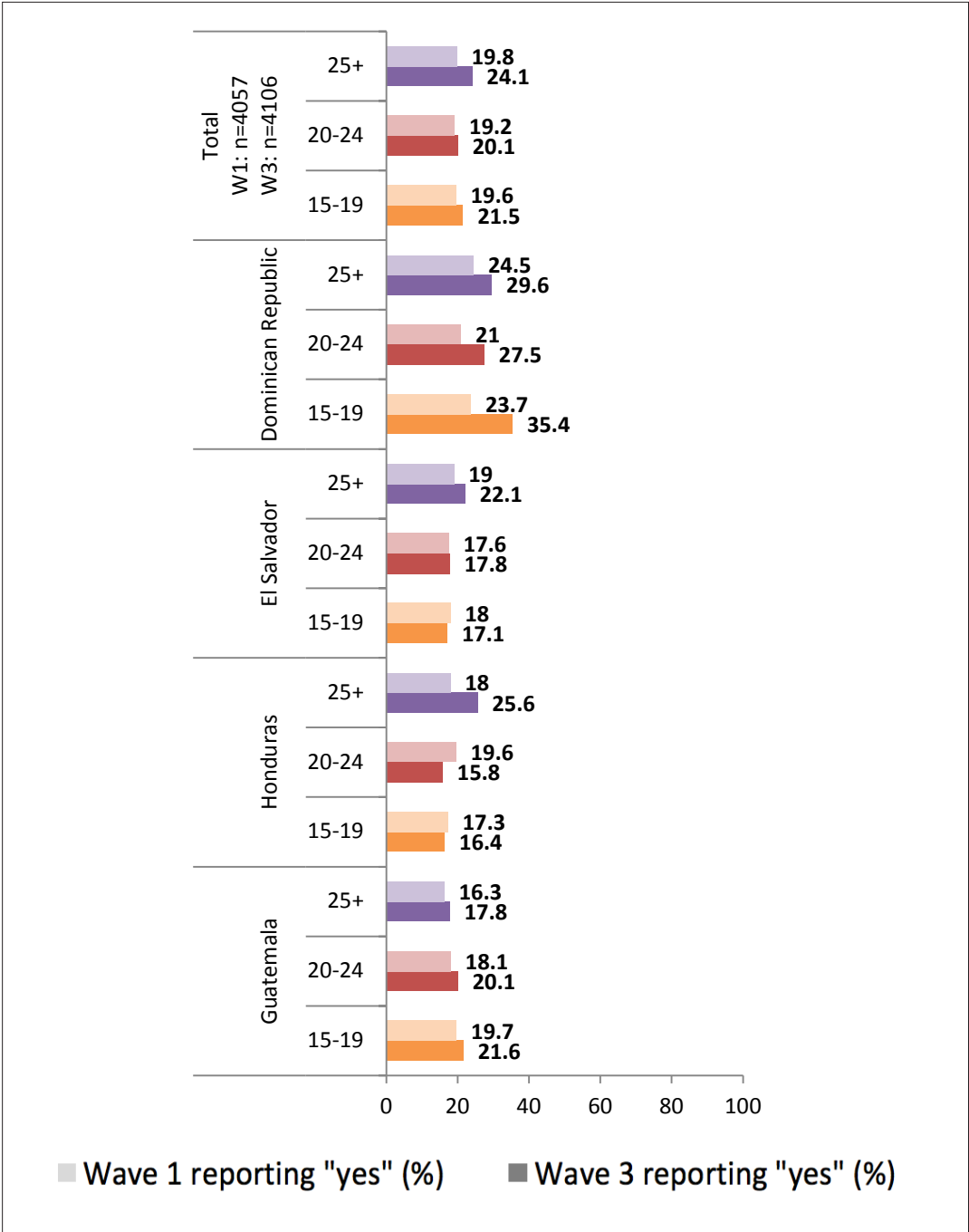
Similar increases from wave 1 to wave 3 in the percent with correct knowledge of the asymptomatic nature of Zika were evident in the sample of pregnant women and males whose partners are pregnant at the time of the survey. More than one third of this group reported knowing that most people with Zika will not have any symptoms (34.5%) in wave 3. Pregnant women and partners of pregnant women in the Dominican Republic had the highest percent with correct knowledge that Zika is often asymptomatic when compared to participants in other countries in wave 3 (42.3%).

Figure 23. Percentage of participants who reported that most people with Zika will not have any symptoms (wave 1 vs. wave 3), by pregnancy/pregnant partner status



From wave 1 to wave 3, a larger percentage of participants across all age groups reported knowledge that most people with Zika will not have any symptoms. However, in El Salvador and Honduras, only adults 25 years and older showed higher percent with correct knowledge of the asymptomatic nature of Zika in wave 3 as compared to wave 1. In the Dominican Republic and Guatemala, a larger percentage of adolescents had knowledge that Zika was often asymptomatic in wave 3 as compared to other age groups, but a higher percentage of adults 25 years and older had correct knowledge in El Salvador and Honduras.

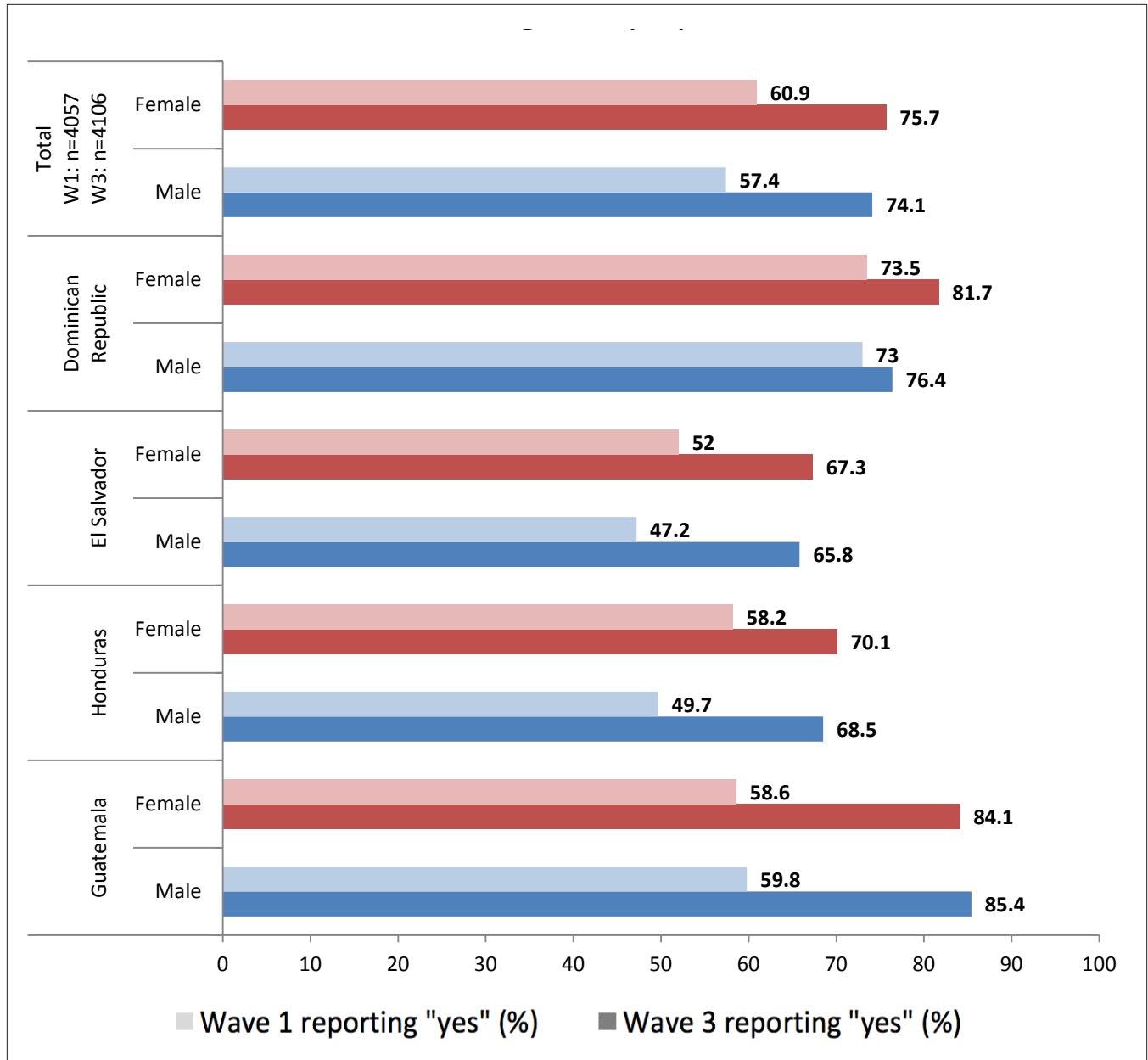
Figure 24. Percentage of participants who reported that most people with Zika will not have any symptoms (wave 1 vs. wave 3), by age



Knowledge that fever is a symptom of Zika

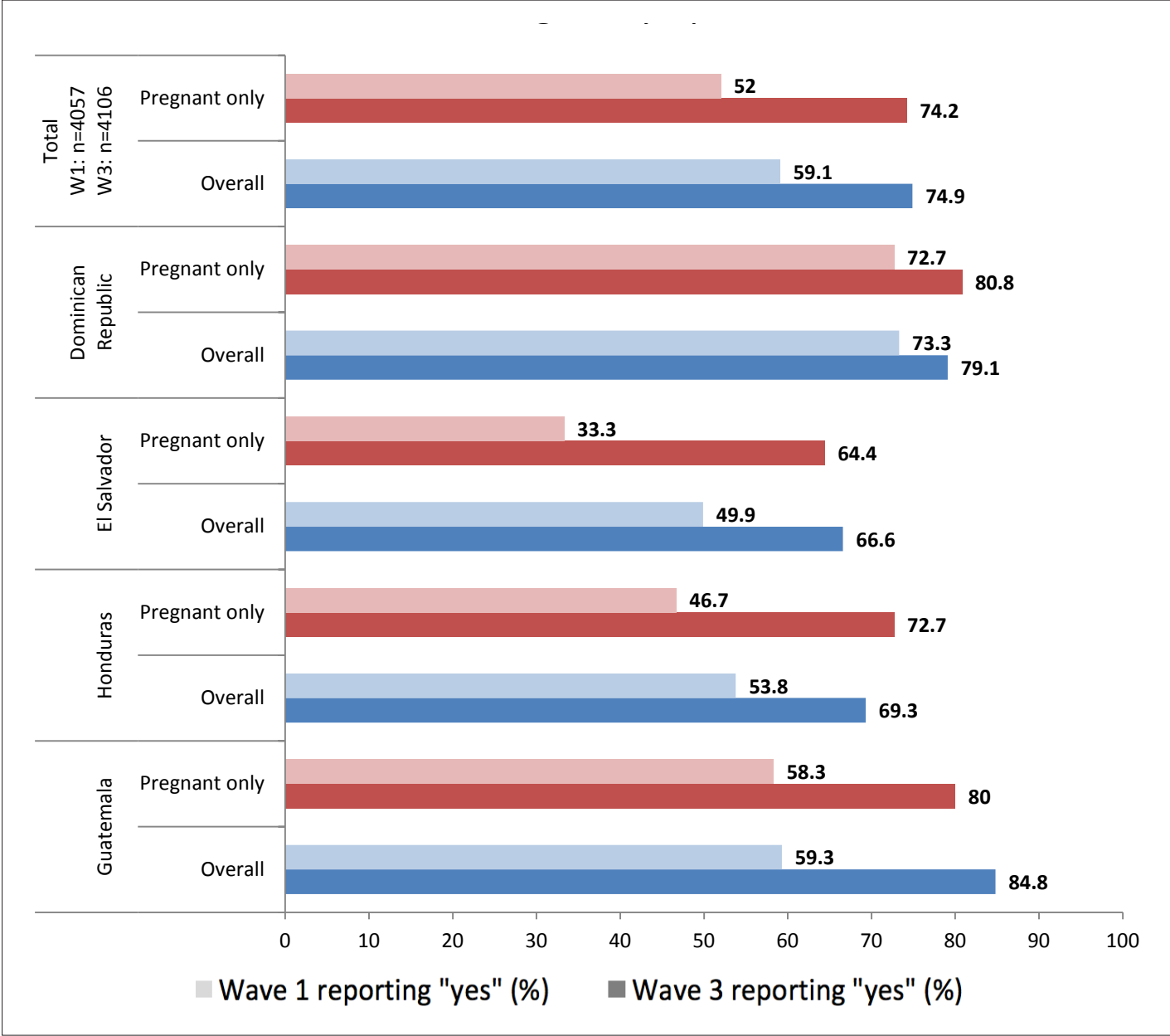
About three quarters of women (75.7%) and men (74.1%) reported that fever was a symptom of Zika in wave 3. The highest percent with knowledge of this symptom was in Guatemala, where 84.1% of women and 85.4% of men reported fever as a symptom.

Figure 25. Percentage of participants who reported that fever is a symptom of Zika (wave 1 vs. wave 3), by gender



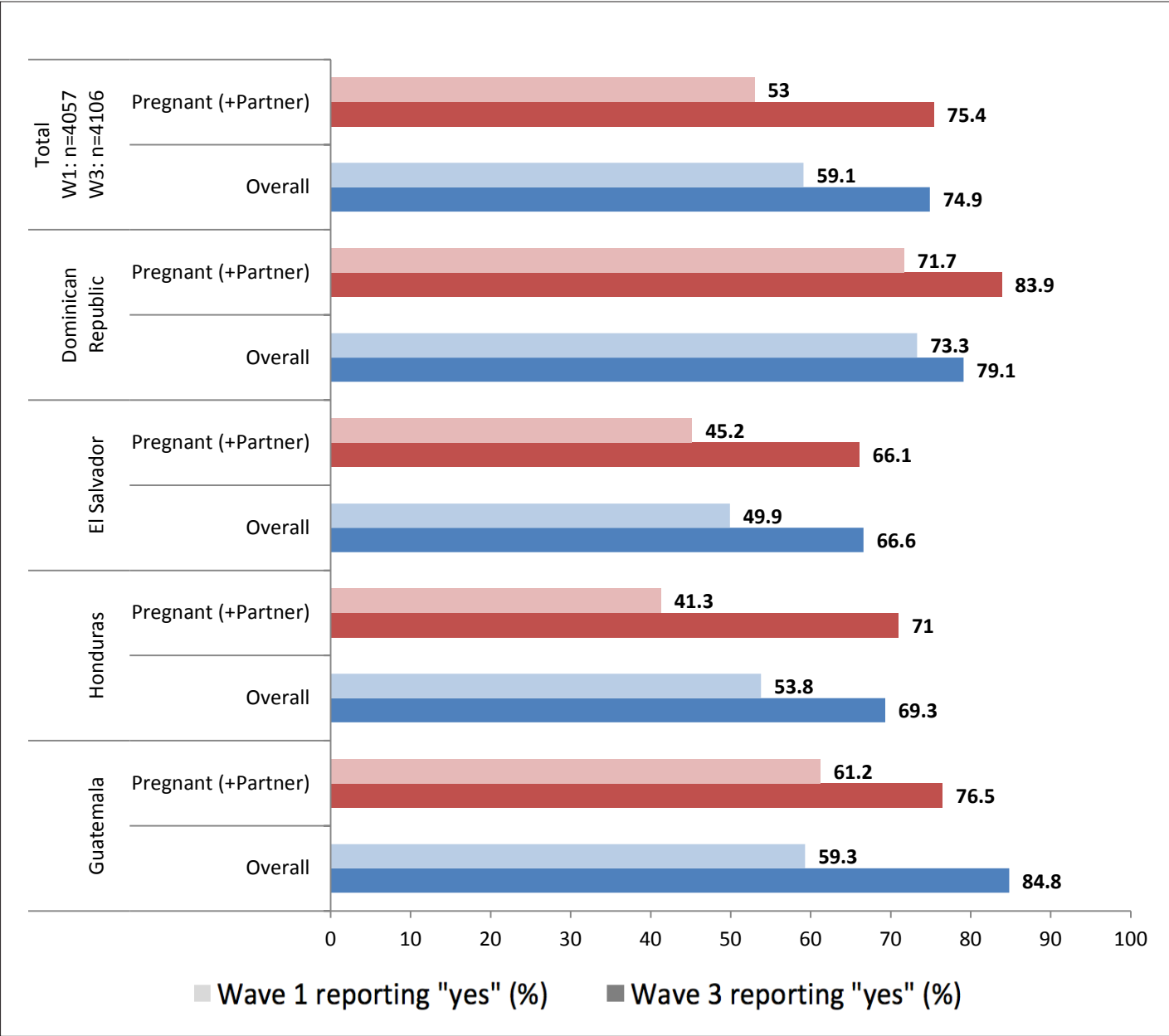
A high percentage of women who were pregnant at the time of the survey had knowledge of fever as a symptom of Zika infection in wave 3 as compared to wave 1. This was true for all four countries, with the Dominican Republic and Guatemala reporting the highest percent with knowledge of fever being a Zika symptom as compared to the other countries.

Figure 26. Percentage of participants who reported that fever is a symptom of Zika (wave 1 vs. wave 3), by pregnancy status



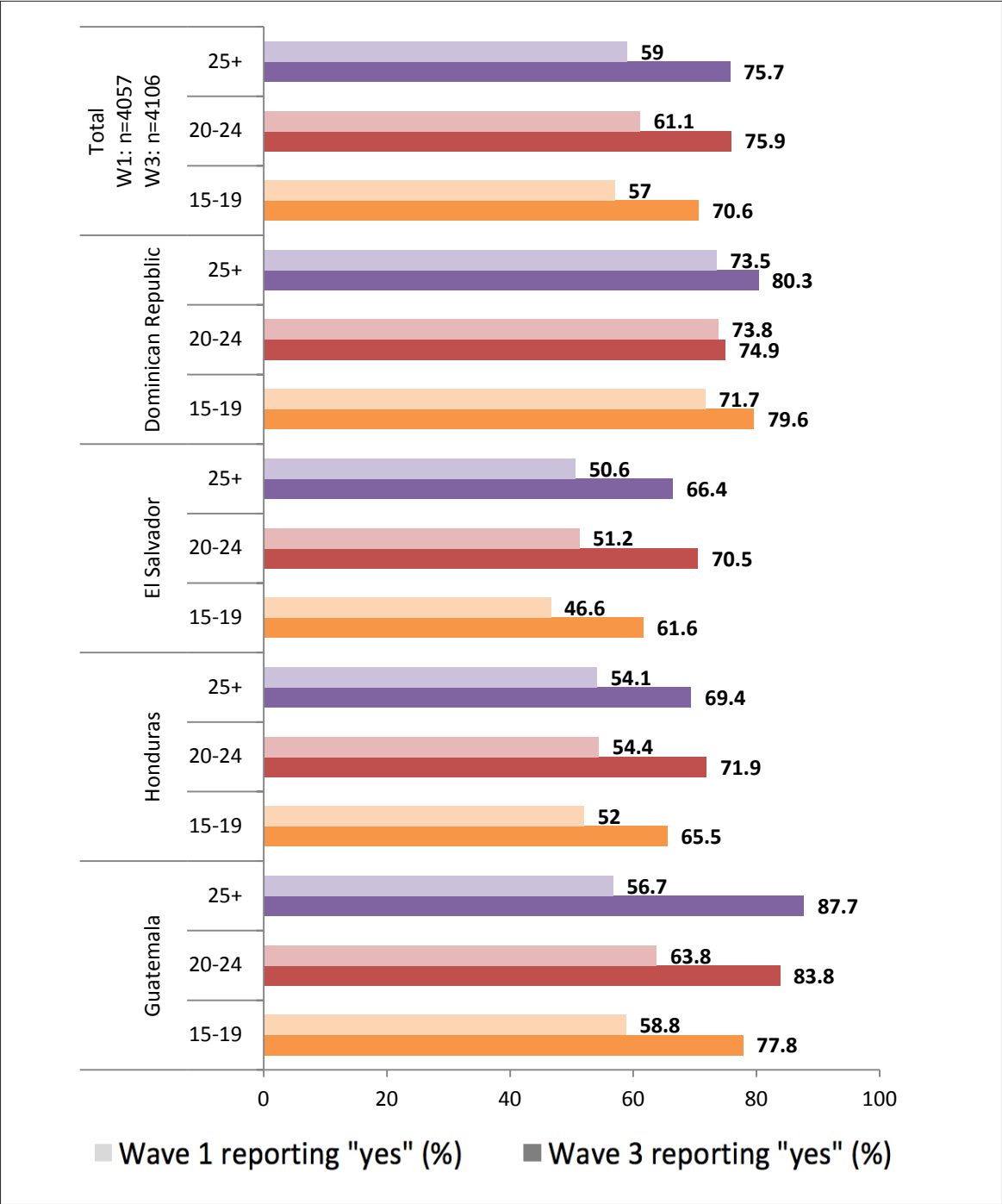
Similar associations were observed for pregnant women and males whose partners were pregnant at the time of the survey.

Figure 27. Percentage of participants who reported that fever is a symptom of Zika (wave 1 vs. wave 3), by pregnancy/ pregnant partner status



The percentage of participants reporting knowledge that fever is a symptom of Zika was higher in wave 3 than in wave 1 across all age groups in all four countries. While adults in the Dominican Republic and Guatemala had the highest percent with knowledge of this symptom of Zika, it was youth that had the highest percent with knowledge in El Salvador and Honduras.

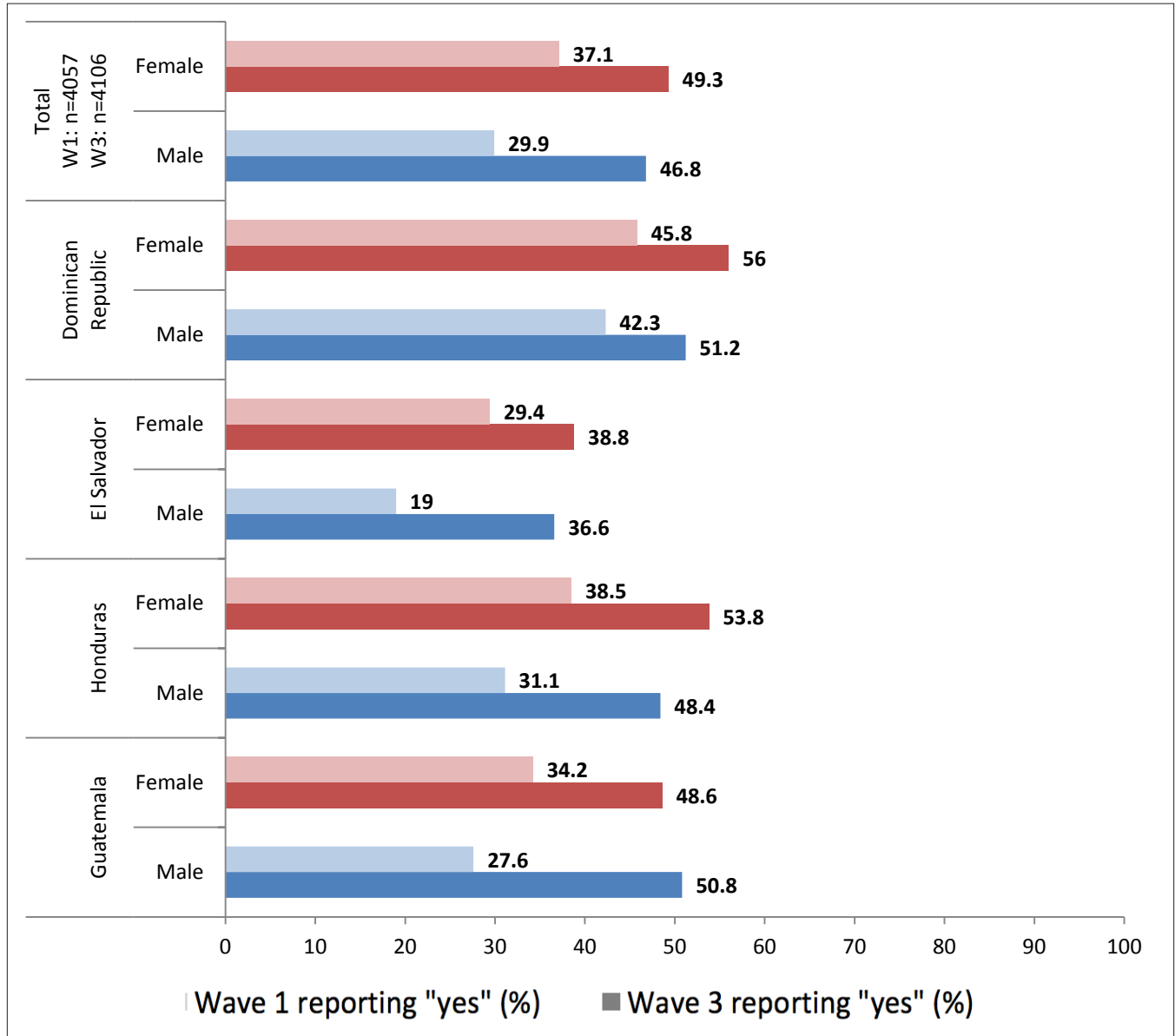
Figure 28. Percentage of participants who reported that fever is a symptom of Zika (wave 1 vs. wave 3), by age



Knowledge that red eyes are a symptom of Zika

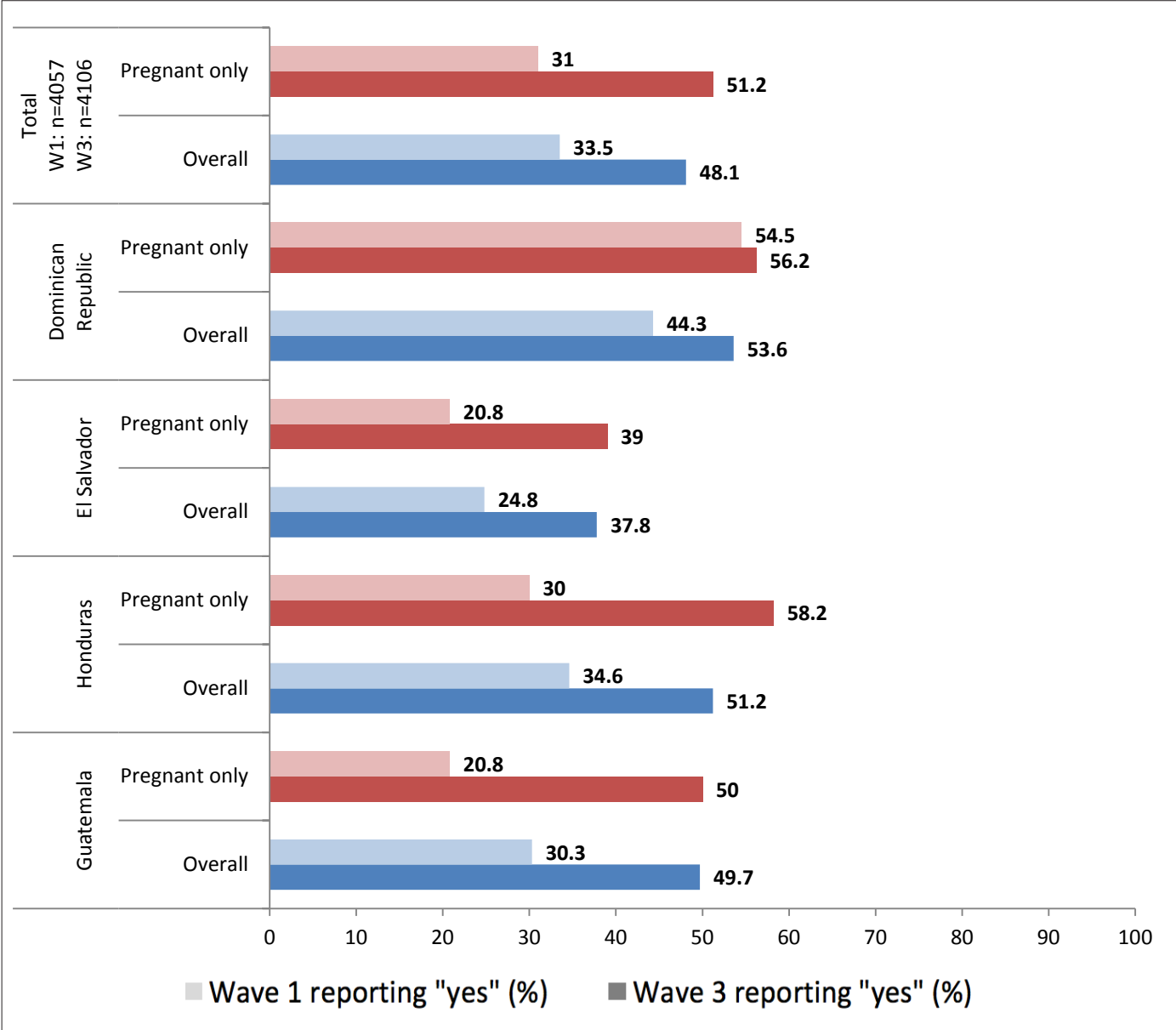
Overall, 49.3% of women and 46.8% of men reported that red eyes were a symptom of Zika in wave 3. By wave 3, a larger percentage of women had this knowledge compared to men in all countries except Guatemala.

Figure 29. Percentage of participants who reported that red eyes are a symptom of Zika (wave 1 vs. wave 3), by gender



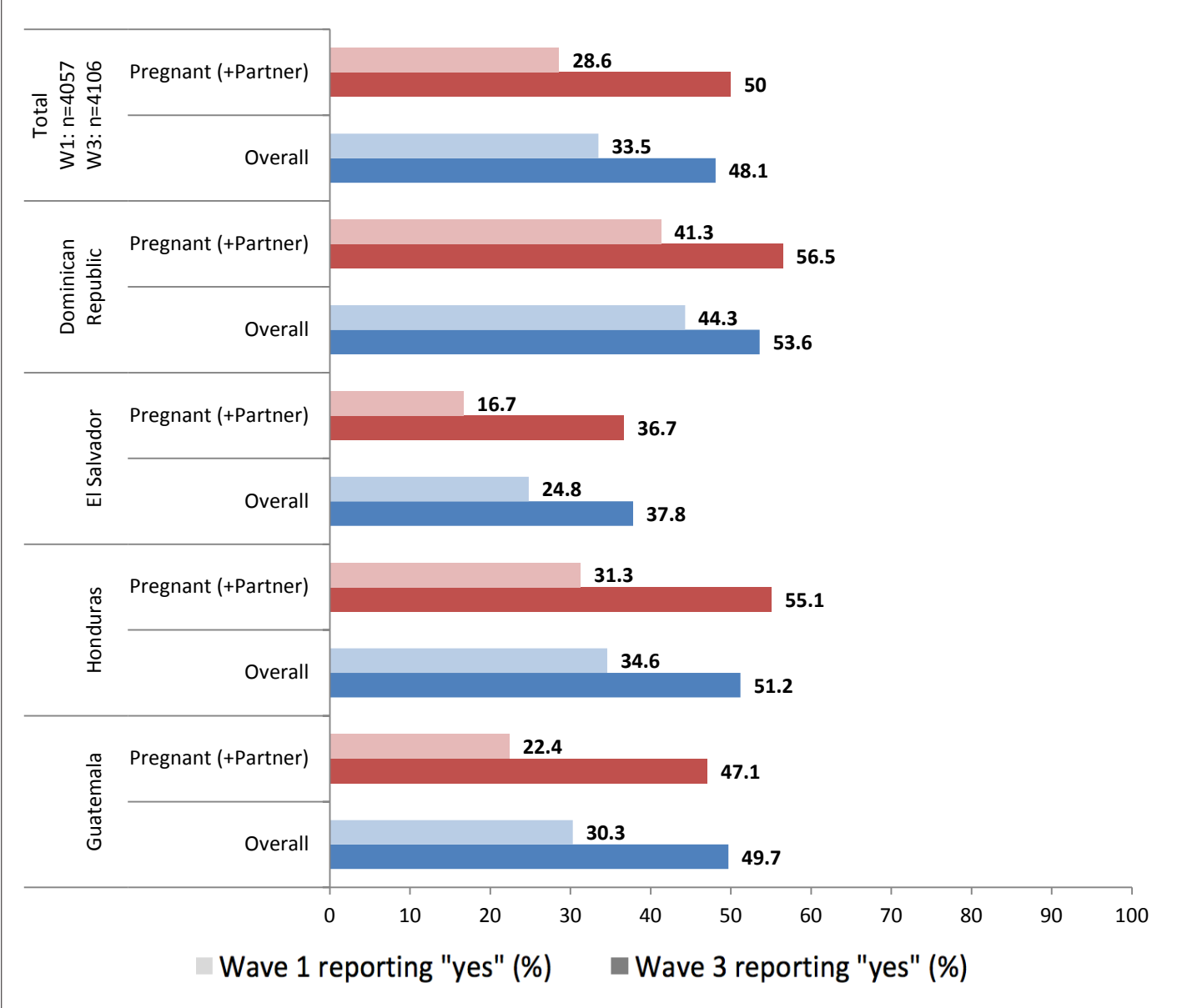
Among participating pregnant women, the percentage with correct knowledge that red eyes are a symptom of Zika was highest in the Dominican Republic (56.2%) and Honduras (58.2%) as compared to other countries in wave 3. In Honduras and Guatemala, the percentage of participants with correct knowledge increased by nearly 30% from wave 1 to wave 3 among pregnant women.

Figure 30. Percentage of participants who reported that red eyes are a symptom of Zika (wave 1 vs. wave 3), by pregnancy status



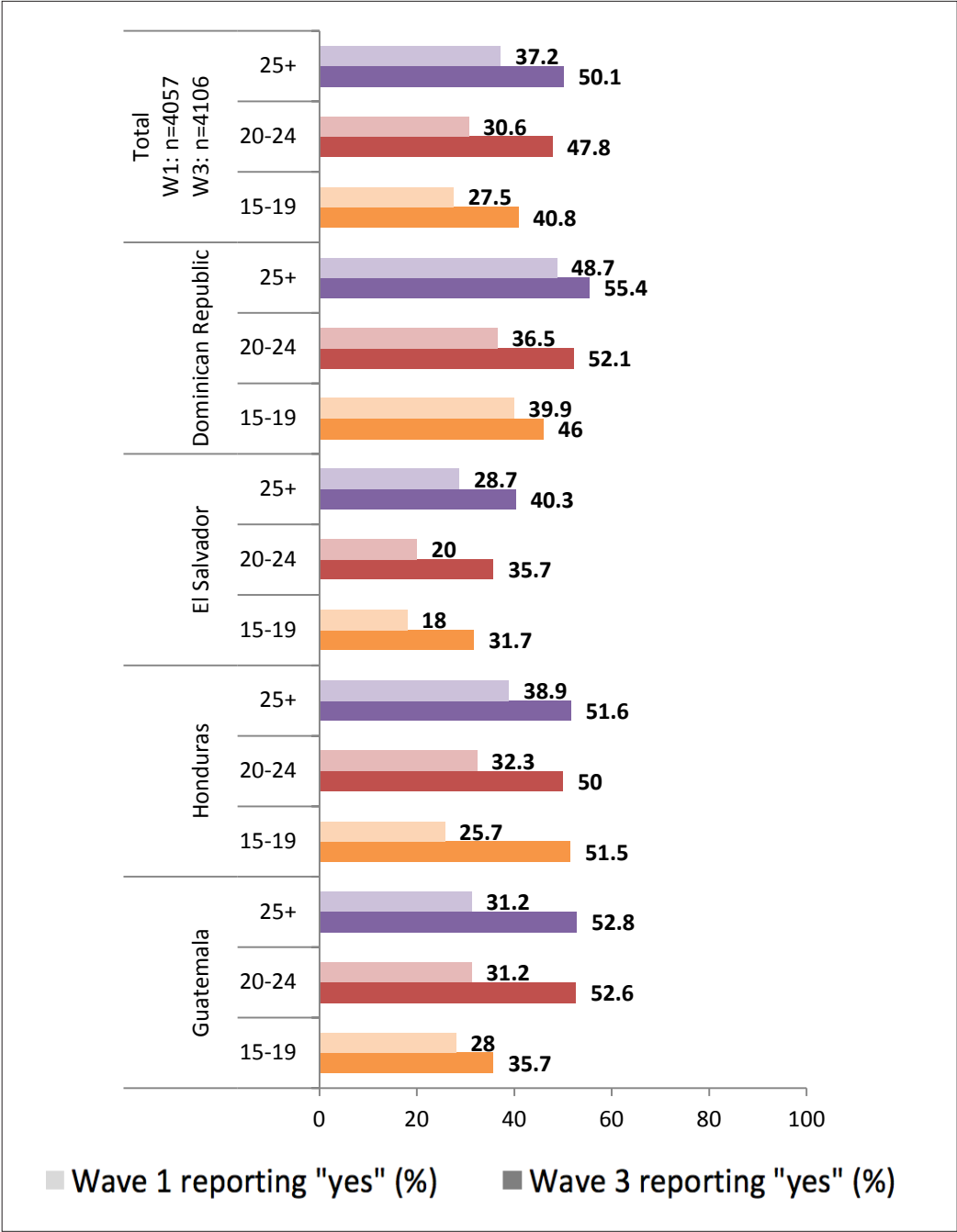
Pregnant women and males whose partners were pregnant at the time of the survey had similar increases in the percentage of participants reporting knowledge of this Zika symptom from wave 1 to wave 3. El Salvador, Honduras, and Guatemala had more pronounced increases in the percentage of participants with correct knowledge of this symptom as compared to the Dominican Republic.

Figure 31. Percentage of participants who reported that red eyes are a symptom of Zika (wave 1 vs. wave 3), by pregnancy/pregnant partner status



The percentage of participants with knowledge that red eyes are a symptom of Zika was highest among adults 25 years and older as compared to other groups in wave 3 across all four countries. Increases in the percent with correct knowledge of this symptom were observed for all age groups in all four countries.

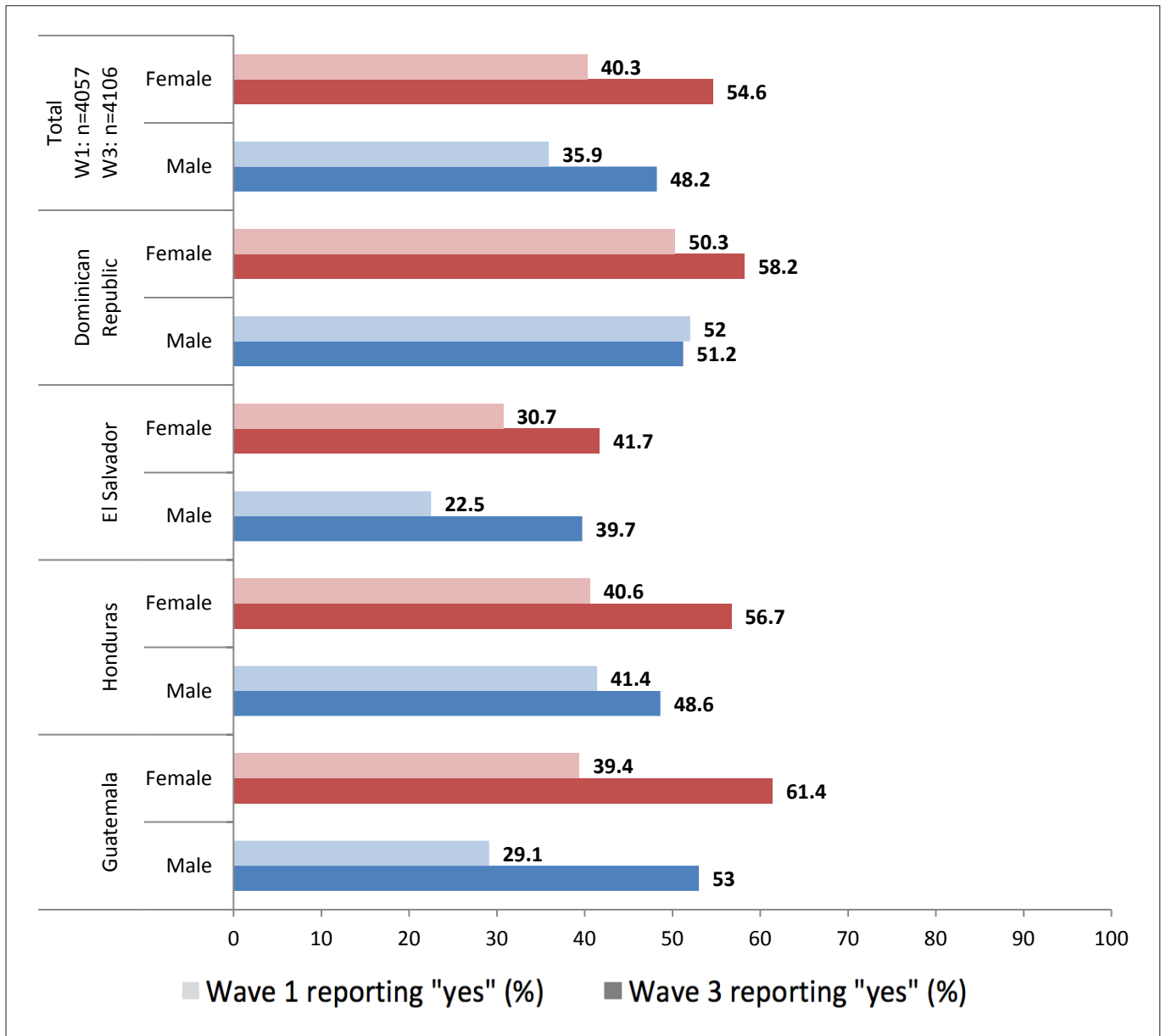
Figure 32. Percentage of participants who reported that red eyes are a symptom of Zika (wave 1 vs. wave 3), by age



Knowledge that a rash is a symptom of Zika

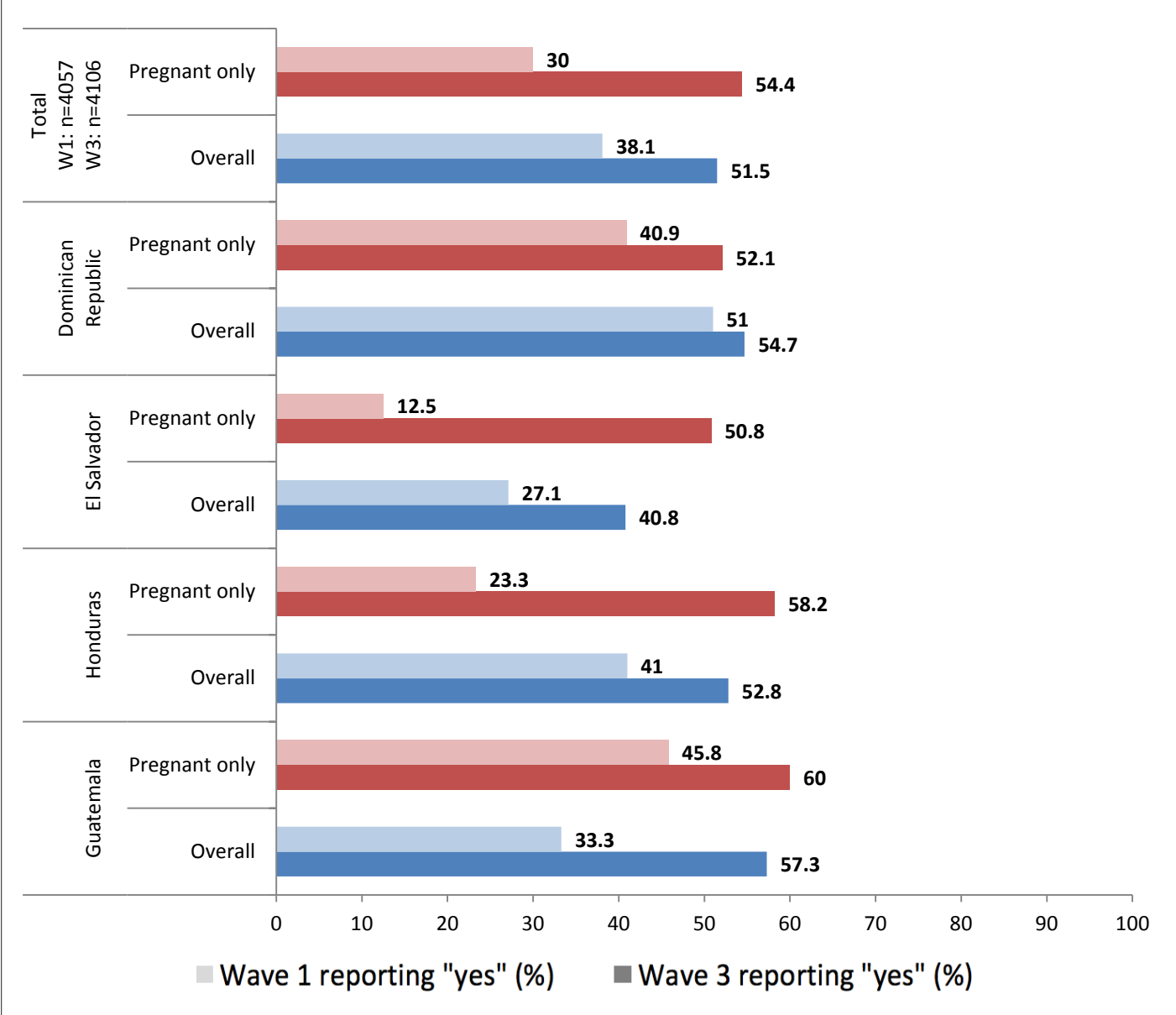
More than half of women (54.6%) and slightly less than half of men (48.6%) reported that rash is a symptom of Zika. These percentages were higher in wave 3 than in wave 1 both overall and in all four countries. A larger percentage of participants reported such knowledge in Guatemala (61.4% for women, 53.0% for men) as compared to other countries.

Figure 33. Percentage of participants who reported that rash is a symptom of Zika (wave 1 vs. wave 3), by gender



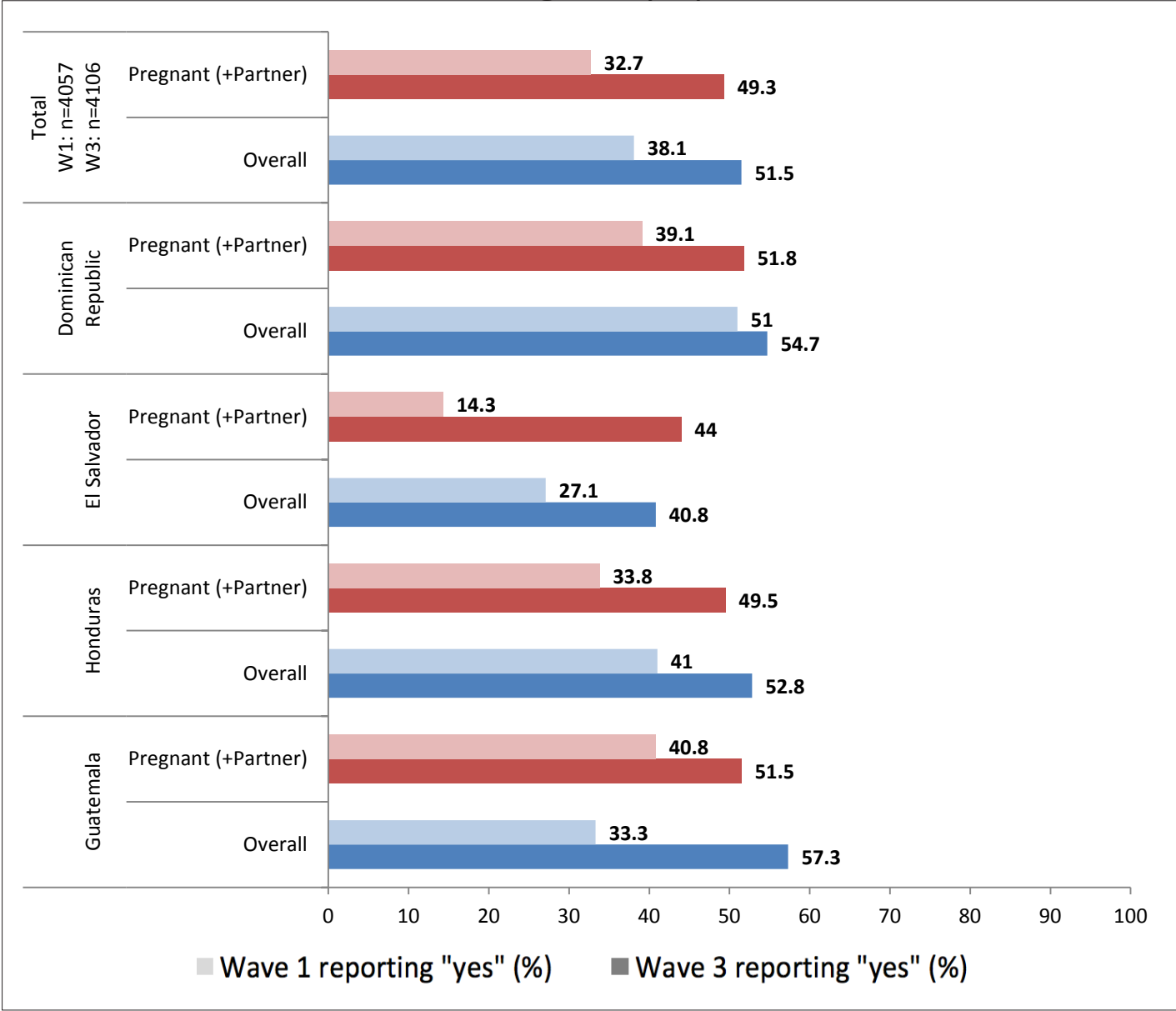
Among participating pregnant women, about half (51.2%) reported that rash is a symptom of Zika. For this sub-group, the percent wit knowledge of this symptom was highest in Honduras in wave 3 (58.2%) as compared to other countries.

Figure 34. Percentage of participants who reported that rash is a symptom of Zika (wave 1 vs. wave 3), by pregnancy status



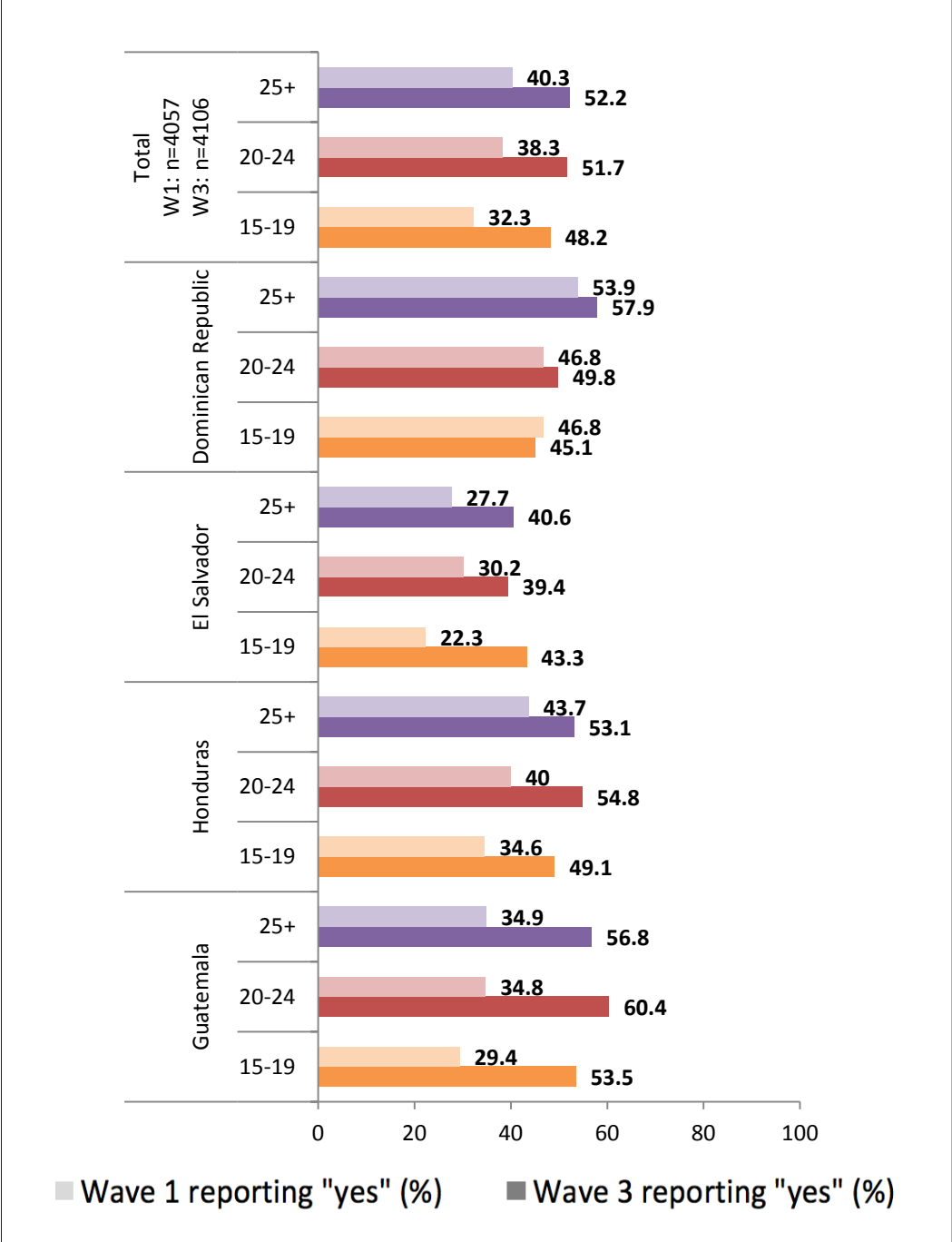
Among pregnant women and males whose partners were pregnant at the time of the survey, rash was described as a symptom of Zika by nearly one half (49.3%) of participants. Responses were similar across all four countries, with El Salvador having the lowest percentage of participants with such knowledge and the Dominican Republic and Guatemala had the highest proportions with knowledge of this Zika symptom.

Figure 35. Percentage of participants who reported that rash is a symptom of Zika (wave 1 vs. wave 3), by pregnancy/ pregnant partner status



Increases in percent with knowledge of rash as a symptom of Zika were evident across all age groups. In the Dominican Republic, more adults 25 years and older had knowledge that rash is a symptom of Zika than younger age groups, but variations were found across age groups in other countries.

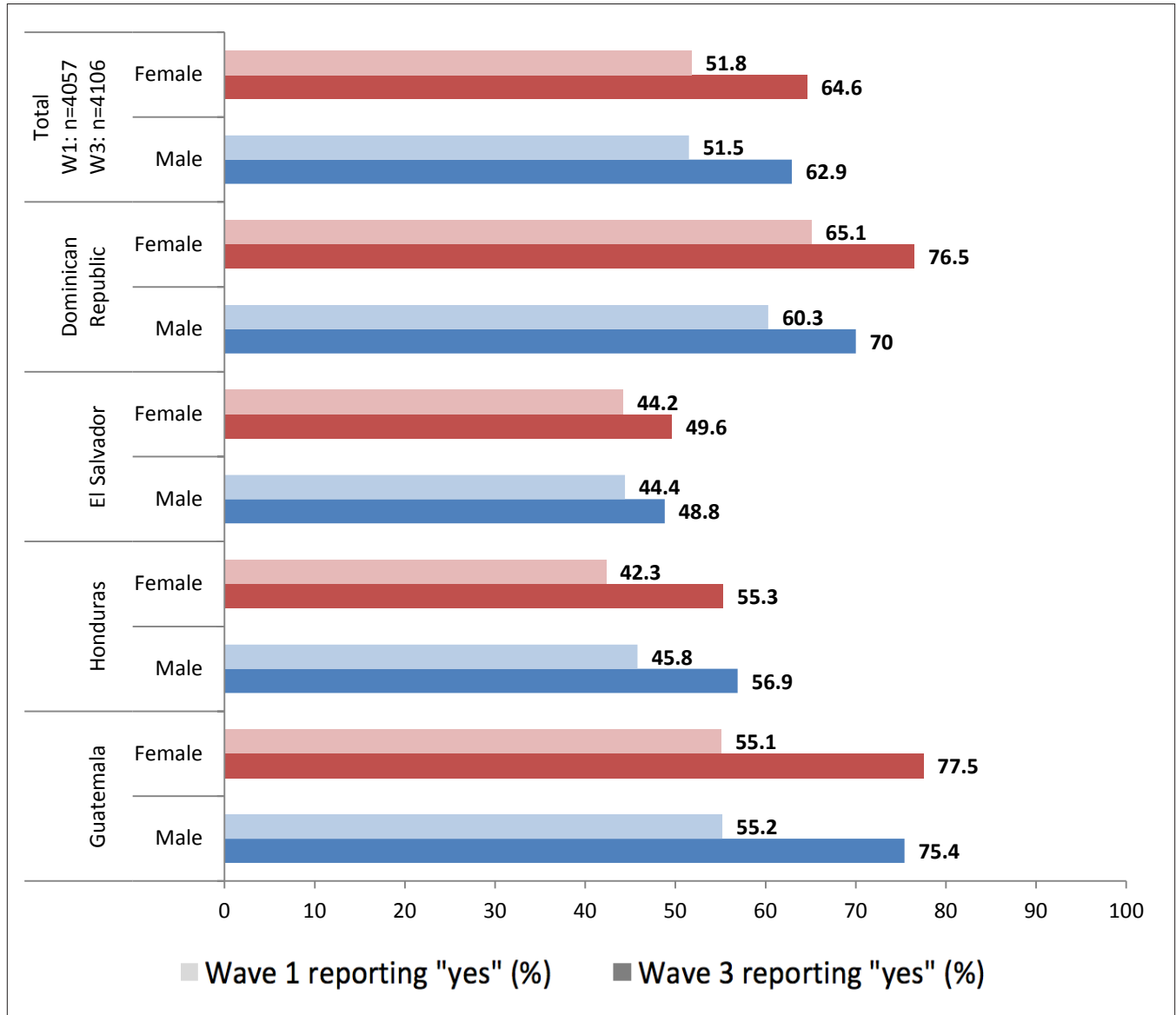
Figure 36. Percentage of participants who reported that rash is a symptom of Zika (wave 1 vs. wave 3), by age



Knowledge that body pain is a symptom of Zika

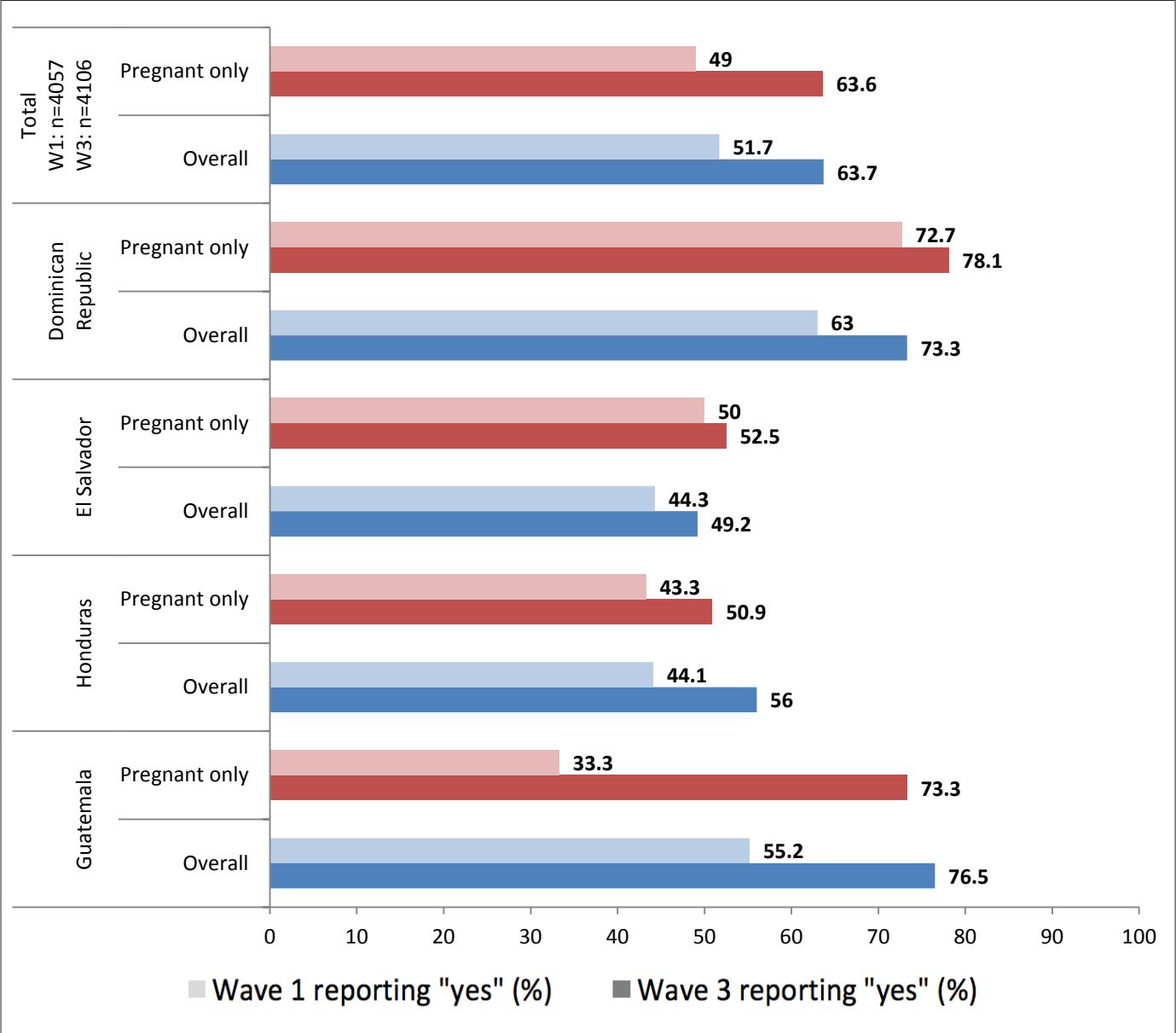
The percentage of participants with knowledge that body pain is a symptom was high among women (64.6%) and men (62.9%) in wave 3. The percentage of participants with such knowledge was highest in the Dominican Republic and Guatemala.

Figure 37. Percentage of participants who reported that body pain is a symptom of Zika (wave 1 vs. wave 3), by gender



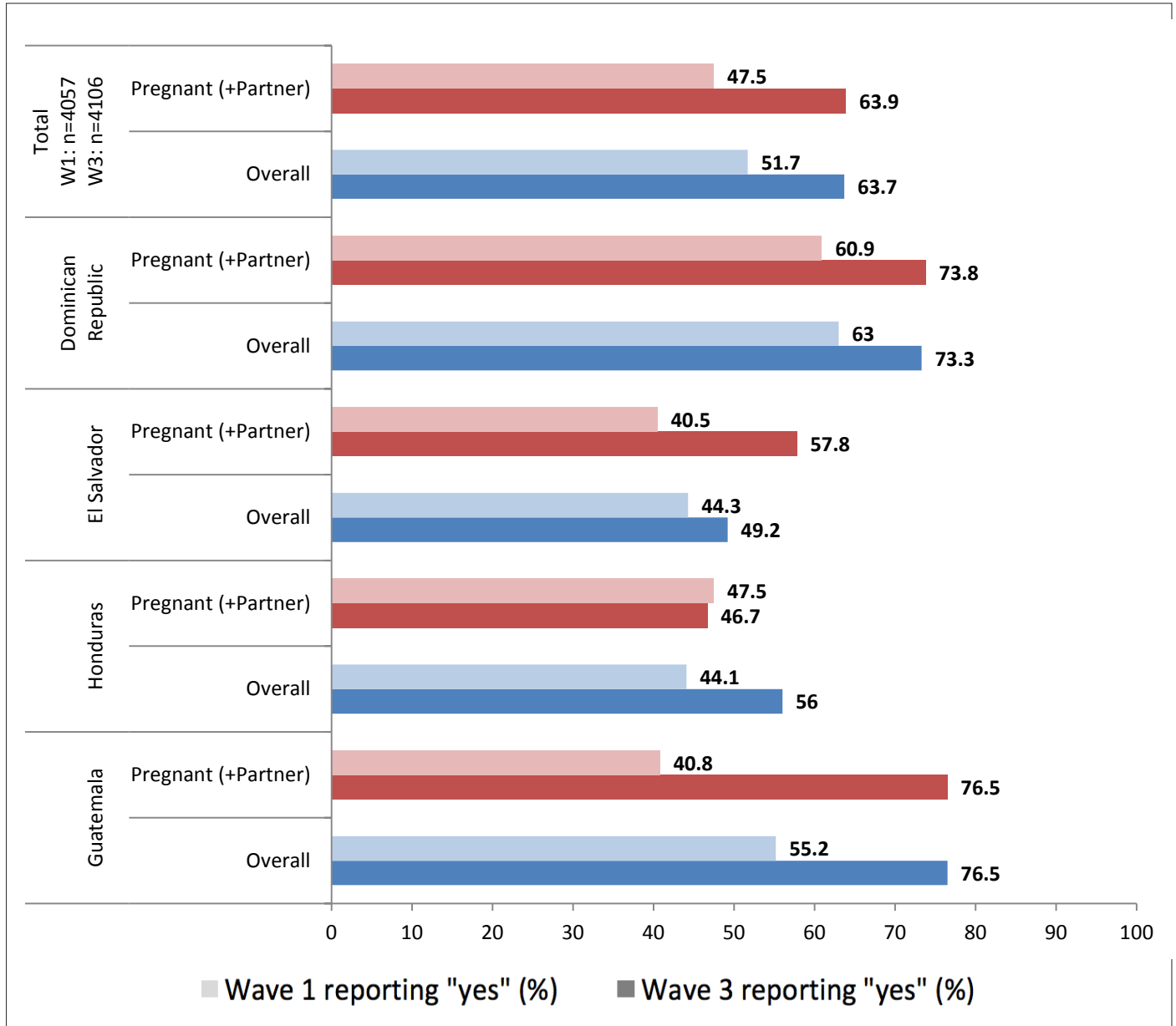
Among participating pregnant women, more than 60% (63.6%) reported that body pain is a symptom of Zika. In El Salvador and Honduras, slightly more than half of pregnant women reported body pain as a symptom of Zika, while in the Dominican Republic more than 70% reported that this symptom was associated with Zika.

Figure 38. Percentage of participants who reported that body pain is a symptom of Zika (wave 1 vs. wave 3), by pregnancy status



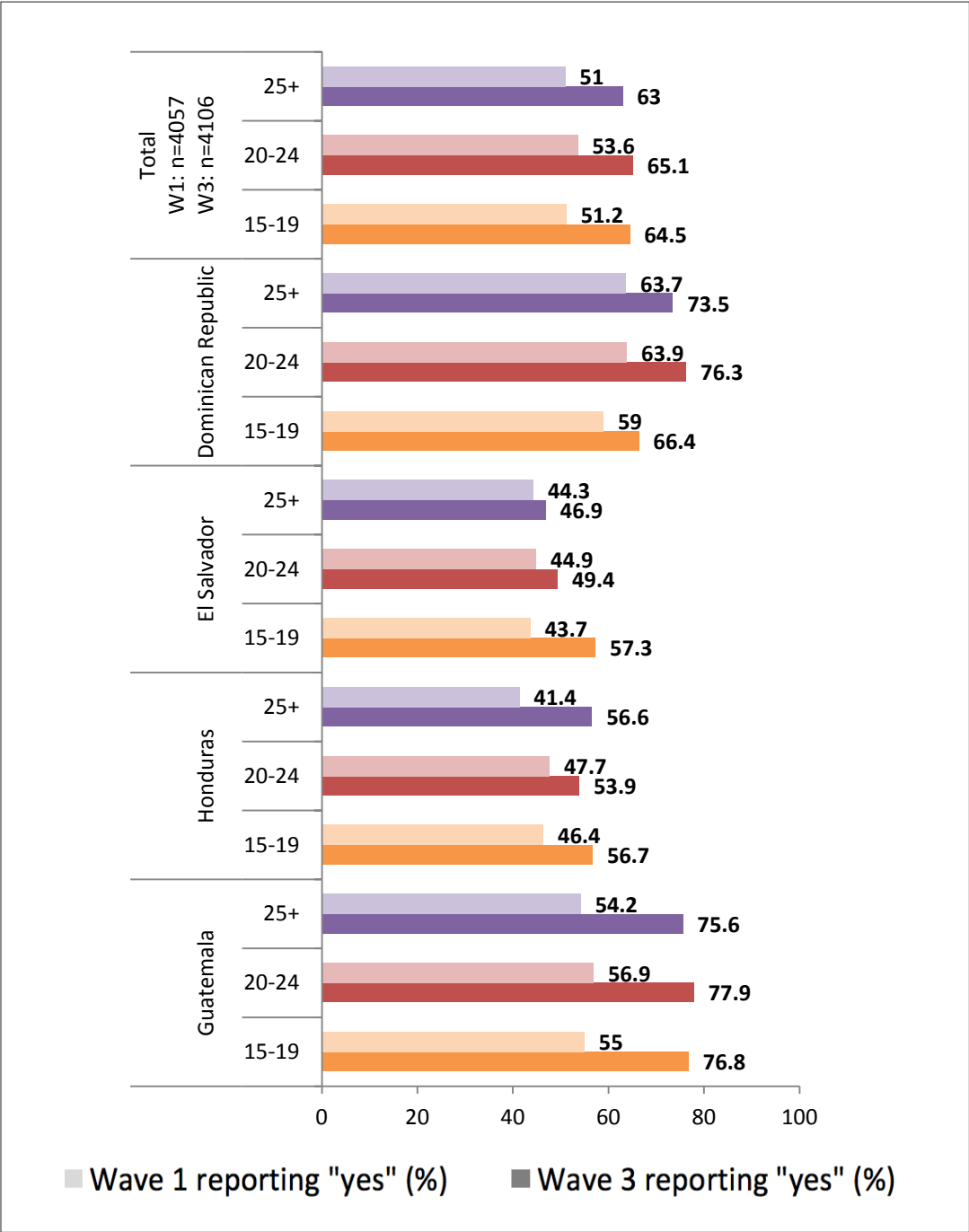
Among participating pregnant women and partners of pregnant women, similar trends in knowledge that body pain is a symptom of Zika were found. Again, higher proportions of participants in the Dominican Republic and Guatemala had correct knowledge as compared to other countries.

Figure 39. Percentage of participants who reported that body pain is a symptom of Zika (wave 1 vs. wave 3), by pregnancy/pregnant partner status



Increases in the percent with knowledge that body pain is a symptom of Zika were evident across age groups from wave 1 to wave 3. More youth in the Dominican Republic and Guatemala had correct knowledge of body pain as a symptom of Zika in wave 3 as compared to other age groups. In contrast, more adolescents in El Salvador and Honduras had correct knowledge that body pain is a symptom of Zika in wave 3 than did other age groups.

Figure 40. Percentage of participants who reported that body pain is a symptom of Zika (wave 1 vs. wave 3), by age

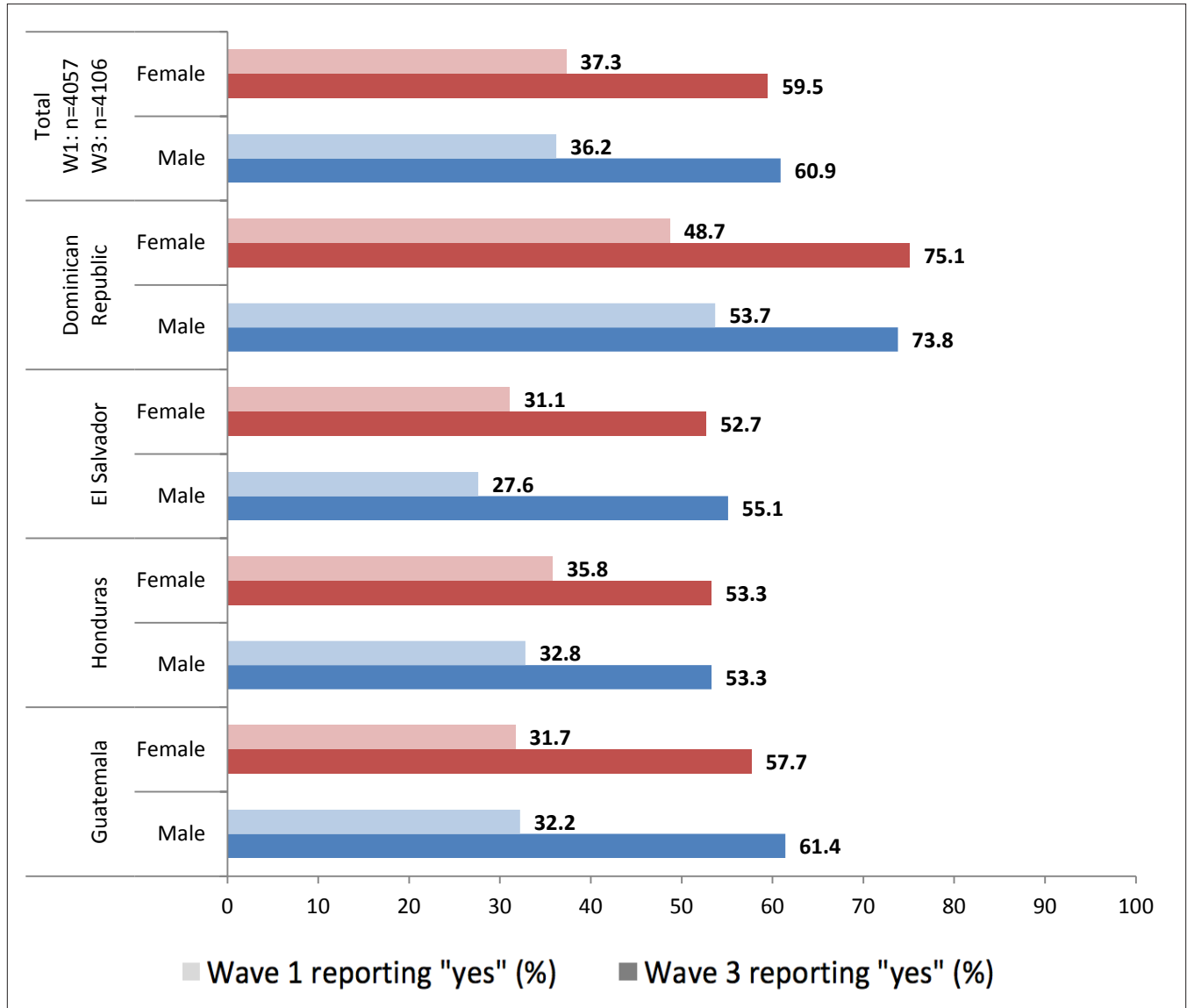


Knowledge of Zika prevention

Knowledge that mosquito repellent will reduce the risk of Zika

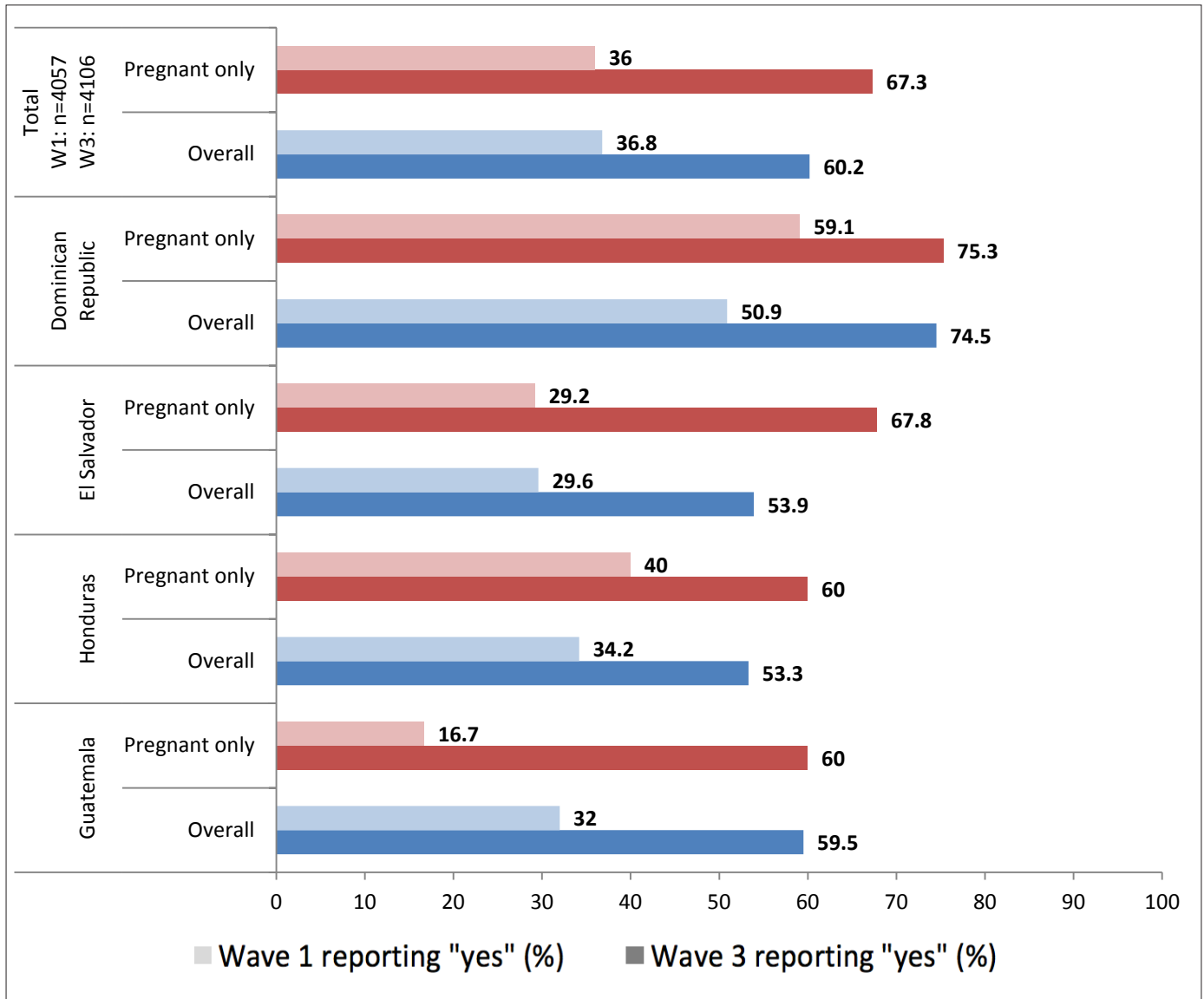
The percentage of participants with knowledge that mosquito repellent will reduce the risk of Zika was significantly higher in wave 3 than in wave 1 both overall and in each of the four countries ($p < 0.0001$). A larger percentage of women and men had correct knowledge that mosquito repellent will prevent Zika in wave 3 (59.5% and 60.9% respectively) than in wave 1 (37.3% and 36.2% respectively) than in wave 1. Higher percentages of participants with knowledge of this prevention strategy were observed across all countries in wave 3 as compared to wave 1.

Figure 41. Percentage of participants who reported that mosquito repellent will reduce the risk of Zika (wave 1 vs. wave 3), by gender



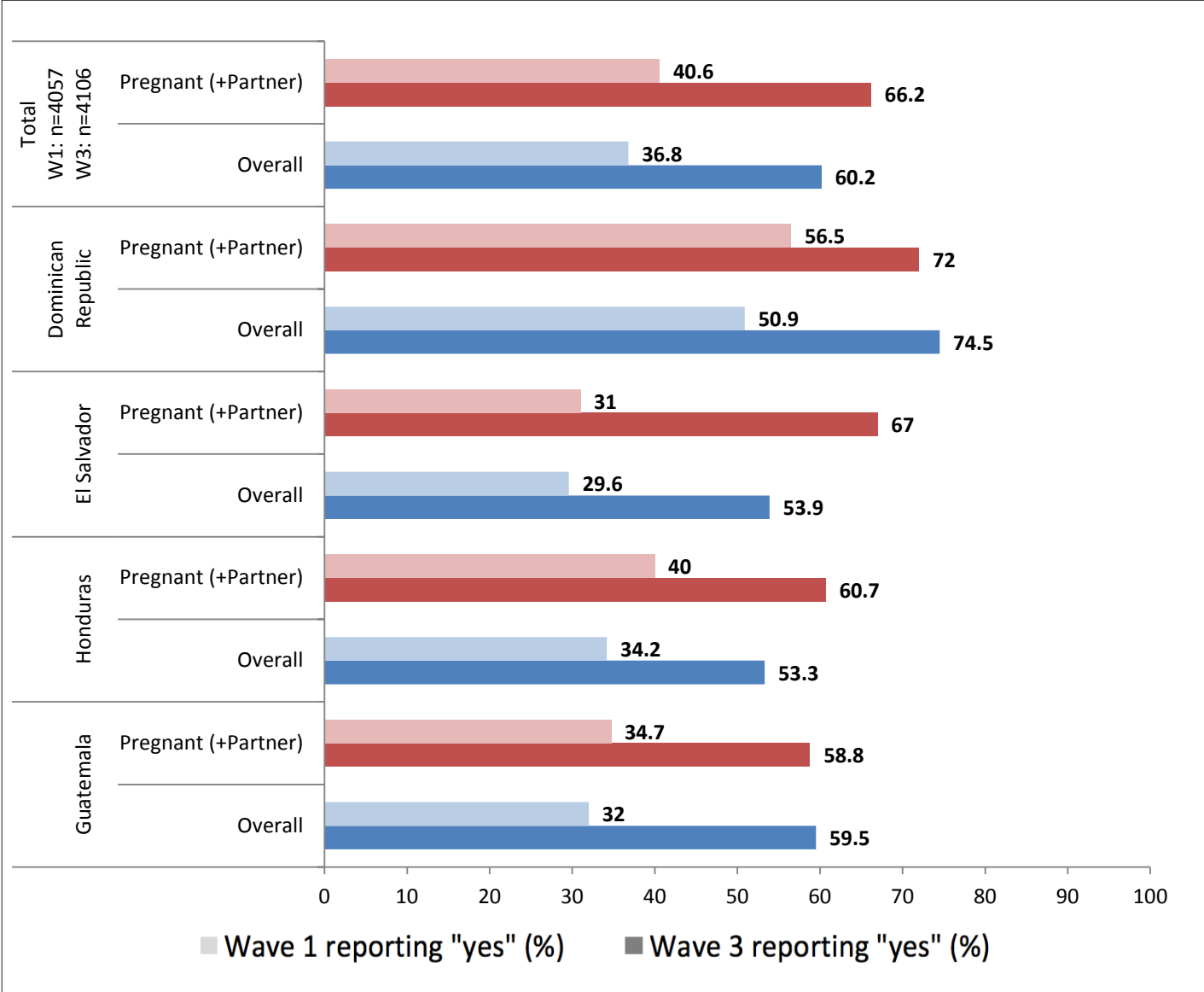
Nearly 60% (59.5%) of pregnant women reported that mosquito repellent would reduce the risk of Zika, which was similar to levels from the overall sample. While responses were highest in the Dominican Republic (75.3%), the other three countries were also high (all over 50%).

Figure 42. Percentage of participants who reported that mosquito repellent will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy status



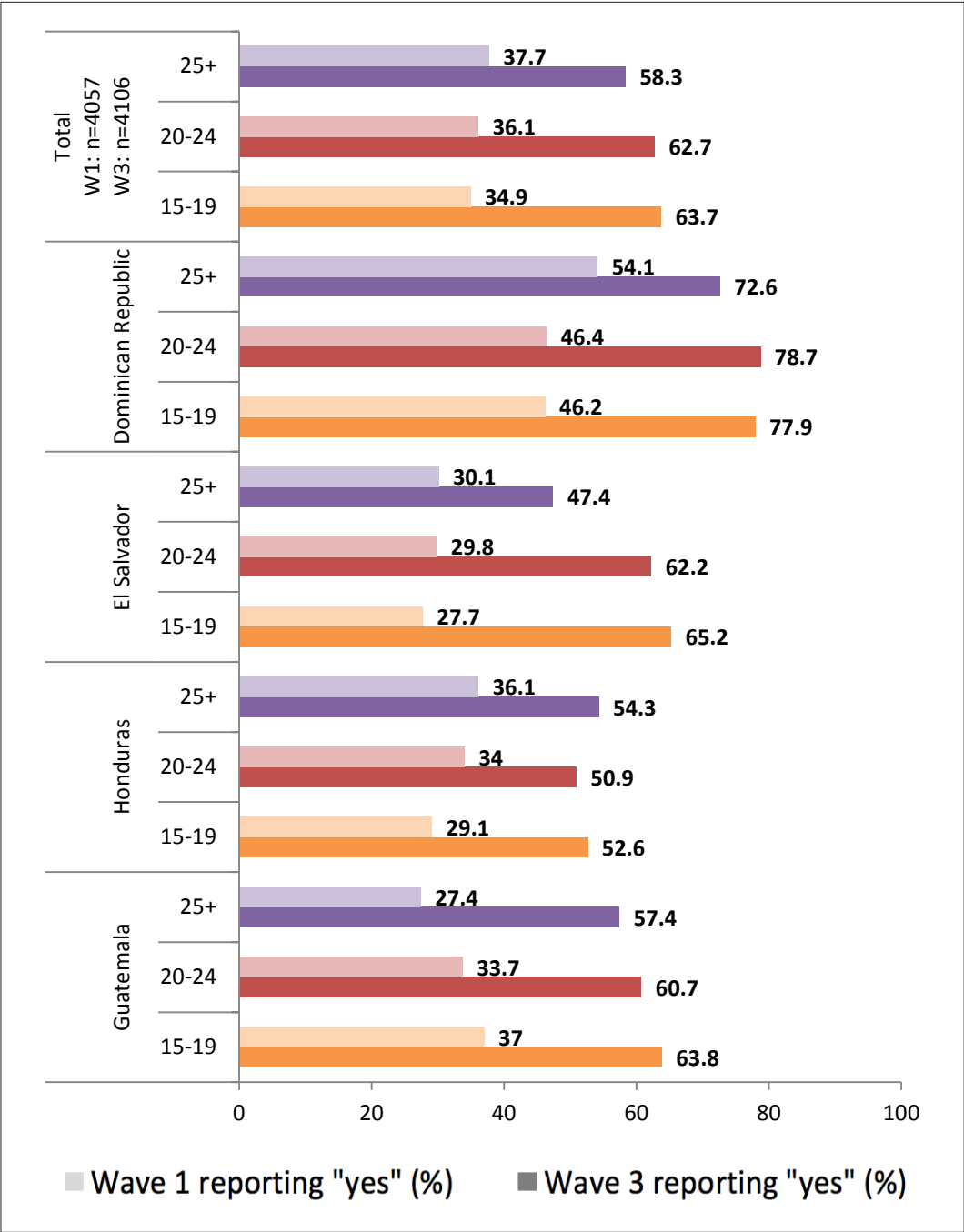
A larger percentage of participating pregnant women and males whose partners were pregnant had correct knowledge of mosquito repellent as a Zika prevention strategy in wave 3 as compared to wave 1. Similar trends were evident across all four countries.

Figure 43. Percentage of participants who reported that mosquito repellent will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy/pregnant partner status



More participants from all age groups had correct knowledge of mosquito repellent as a prevention strategy in wave 3 as compared to wave 1. There were increases among adolescents with correct knowledge of this prevention strategy across all countries. In El Salvador, fewer adults 25 years and older had this knowledge (wave 3: 47.4%) when compared to other age groups in El Salvador as well as across all countries.

Figure 44. Percentage of participants who reported that mosquito repellent will reduce the risk of Zika (wave 1 vs. wave 3), by age

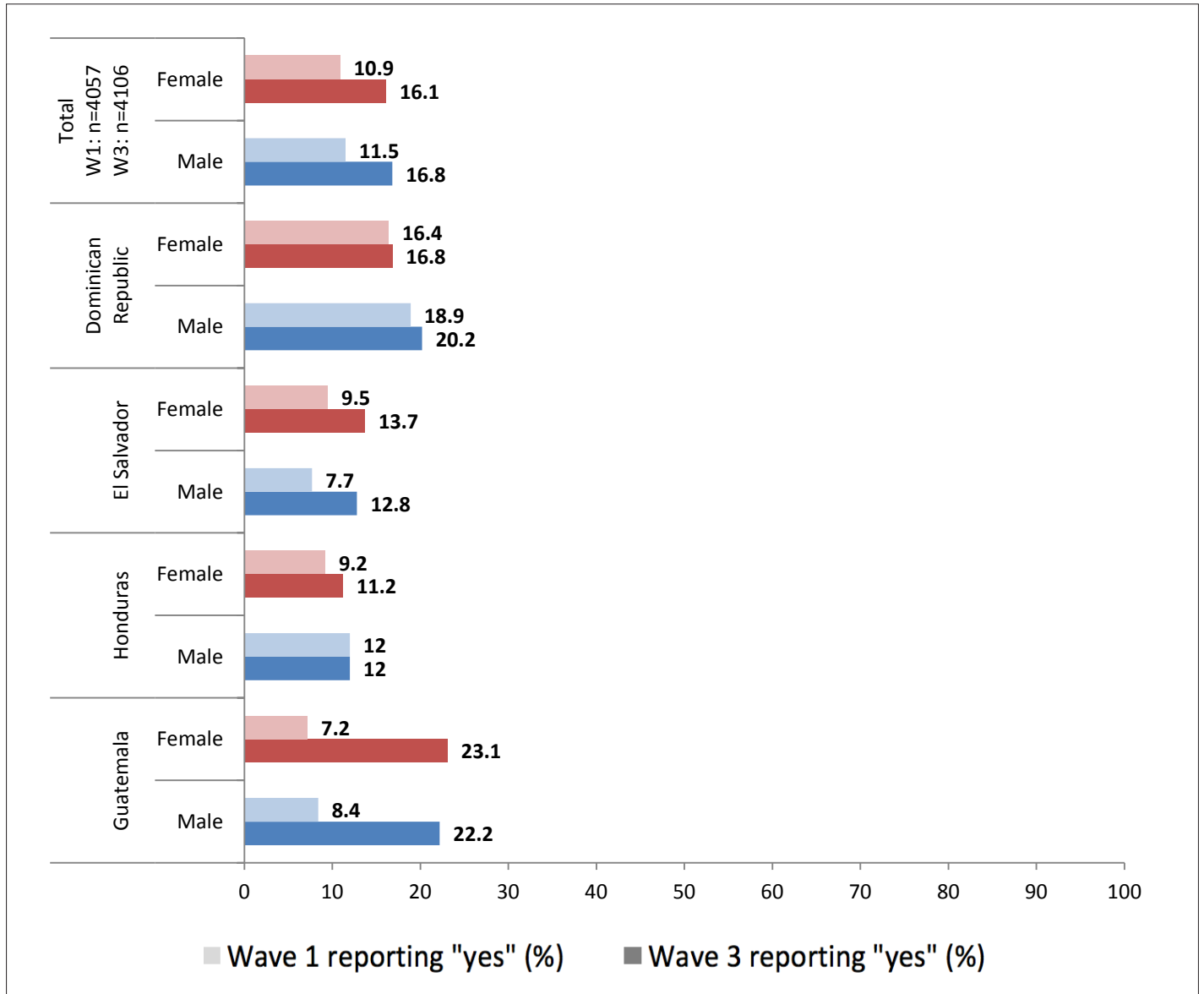


Knowledge that condoms will reduce the risk of Zika

When compared to wave 1, the percentage of respondents with knowledge that condoms will reduce the risk of Zika was significantly higher in wave 3 overall ($p < 0.0001$) as well as in El Salvador ($p = 0.0011$) and Guatemala ($p < 0.0001$).

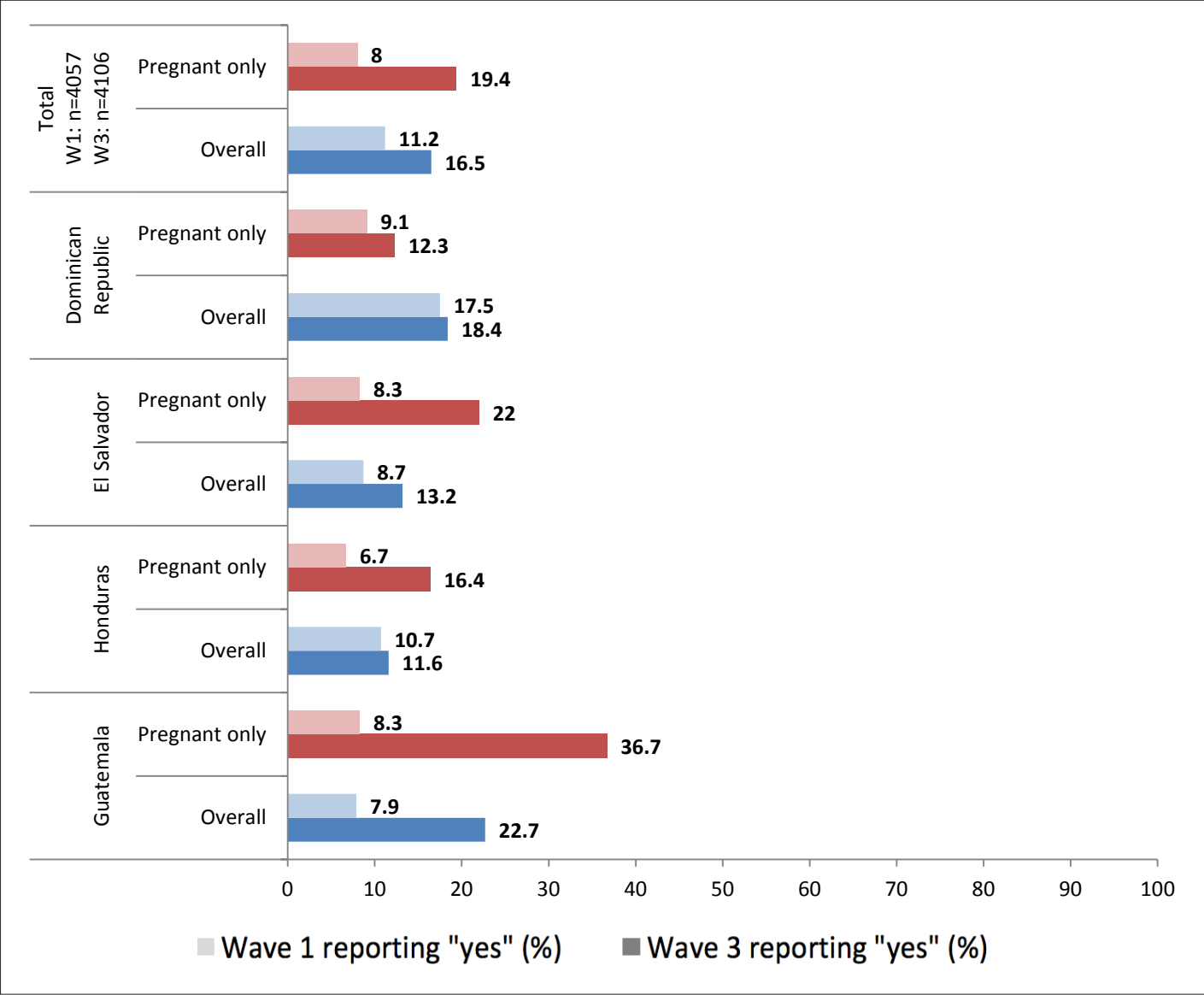
The percentage of participants with knowledge that condom use will reduce the risk of Zika was lower among women (16.1%) and men (16.8%) in wave 3 when compared to the percentages of participants with knowledge of other prevention strategies.

Figure 45. Percentage of participants who reported that condoms will reduce the risk of Zika (wave 1 vs. wave 3), by gender



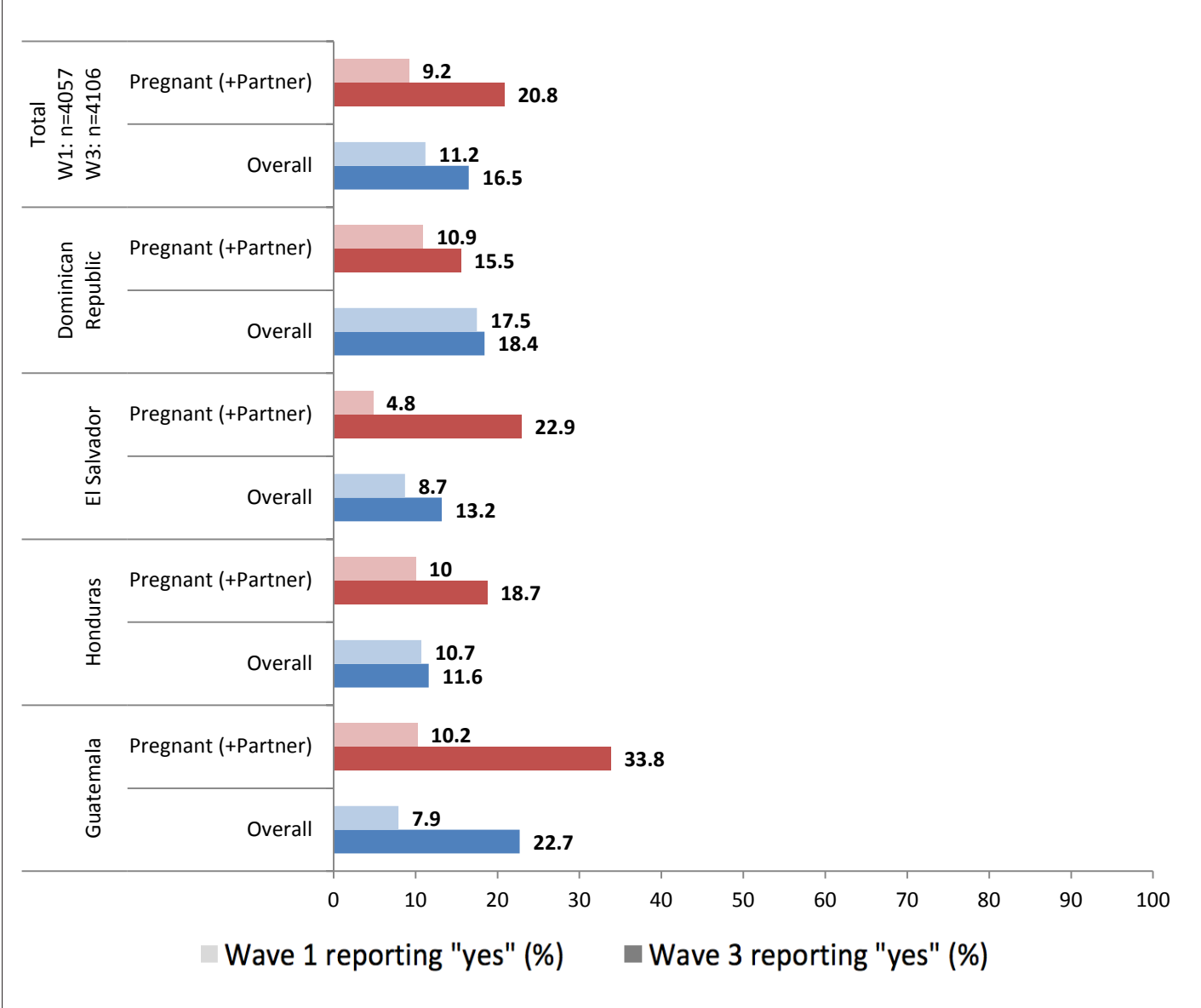
Knowledge of condom use as a prevention strategy was reported by nearly 20% (19.4%) of pregnant women, with more than one third of pregnant women from Guatemala reporting such knowledge in wave 3 (36.7%).

Figure 46. Percentage of participants who reported that condoms will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy status



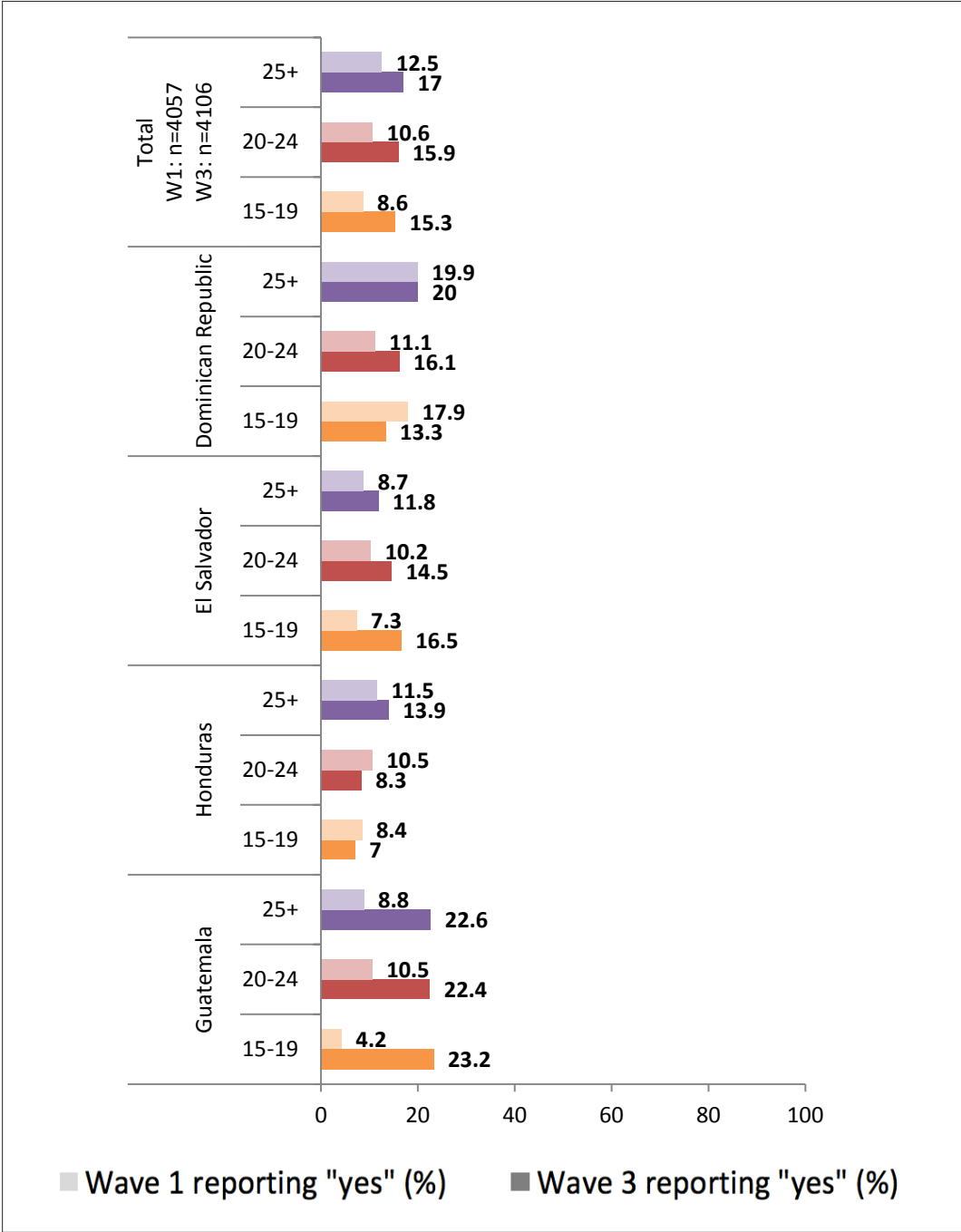
Similarly, the percentage of participants with knowledge that use of condoms will reduce the risk of Zika was higher in wave 3 than wave 1 among participating pregnant women and partners of pregnant women. More than one fifth of these participants in El Salvador (22.9%) and Guatemala (33.8%) had correct knowledge in wave 3.

Figure 47. Percentage of participants who reported that condoms will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy/pregnant partner status



In the Dominican Republic and Honduras, the percentage of participants with correct knowledge that condoms will reduce the risk of Zika was higher among adults 25 years and older as compared to younger age groups. In contrast, fewer adults in El Salvador had correct knowledge as compared to other age groups (11.8%). In the Dominican Republic and Honduras, proportions with correct knowledge of condoms as a prevention strategy did not show consistent increases from wave 1 to wave 3.

Figure 48. Percentage of participants who reported that condoms will reduce the risk of Zika (wave 1 vs. wave 3), by age

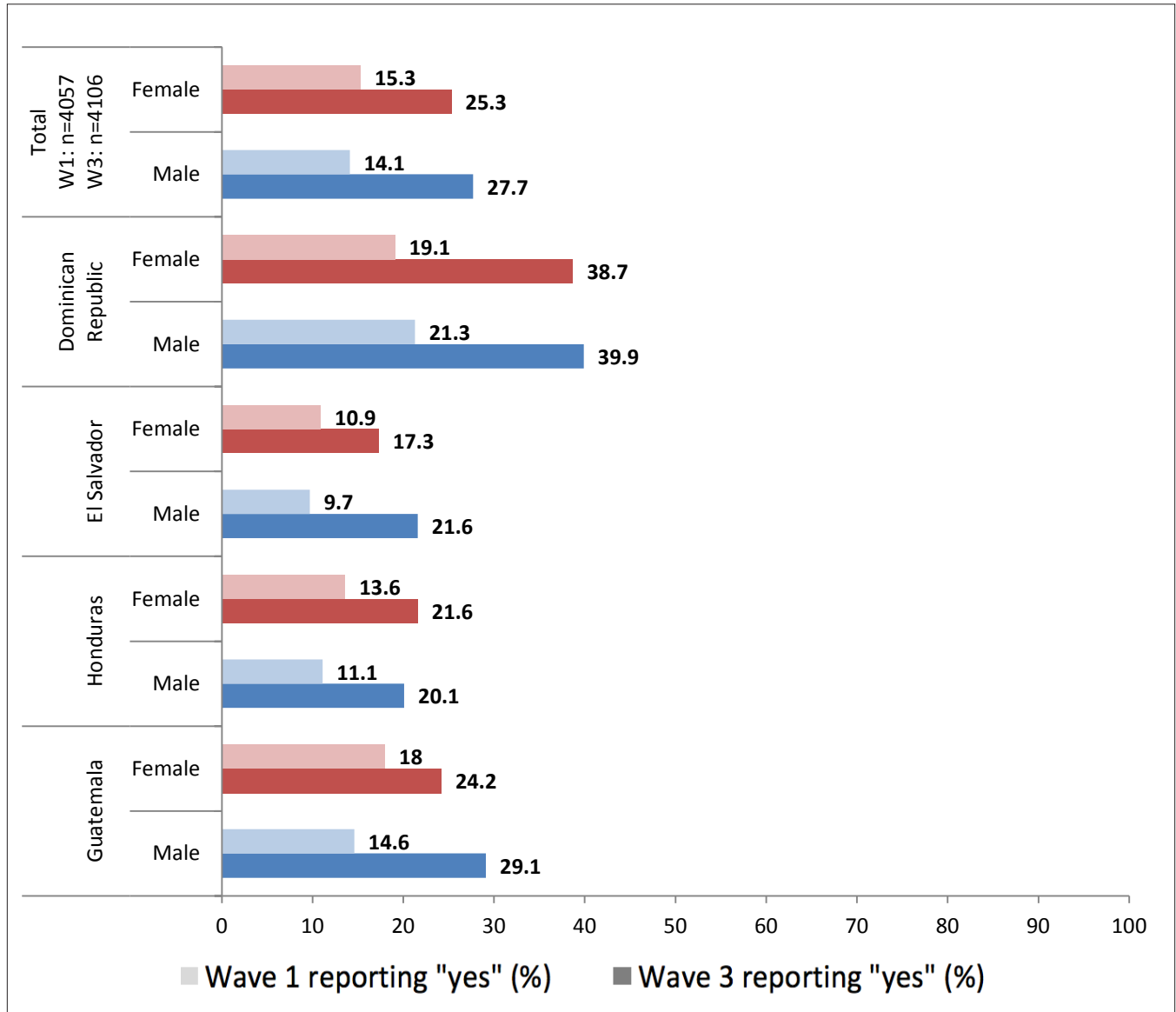


Knowledge that screens on windows and doors will reduce the risk of Zika

The percentage of participants with correct knowledge that screens on windows and doors will reduce the risk of Zika was significantly greater in wave 3 than in wave 1. This was true for the full sample as well as for each of the four countries ($p < 0.0001$).

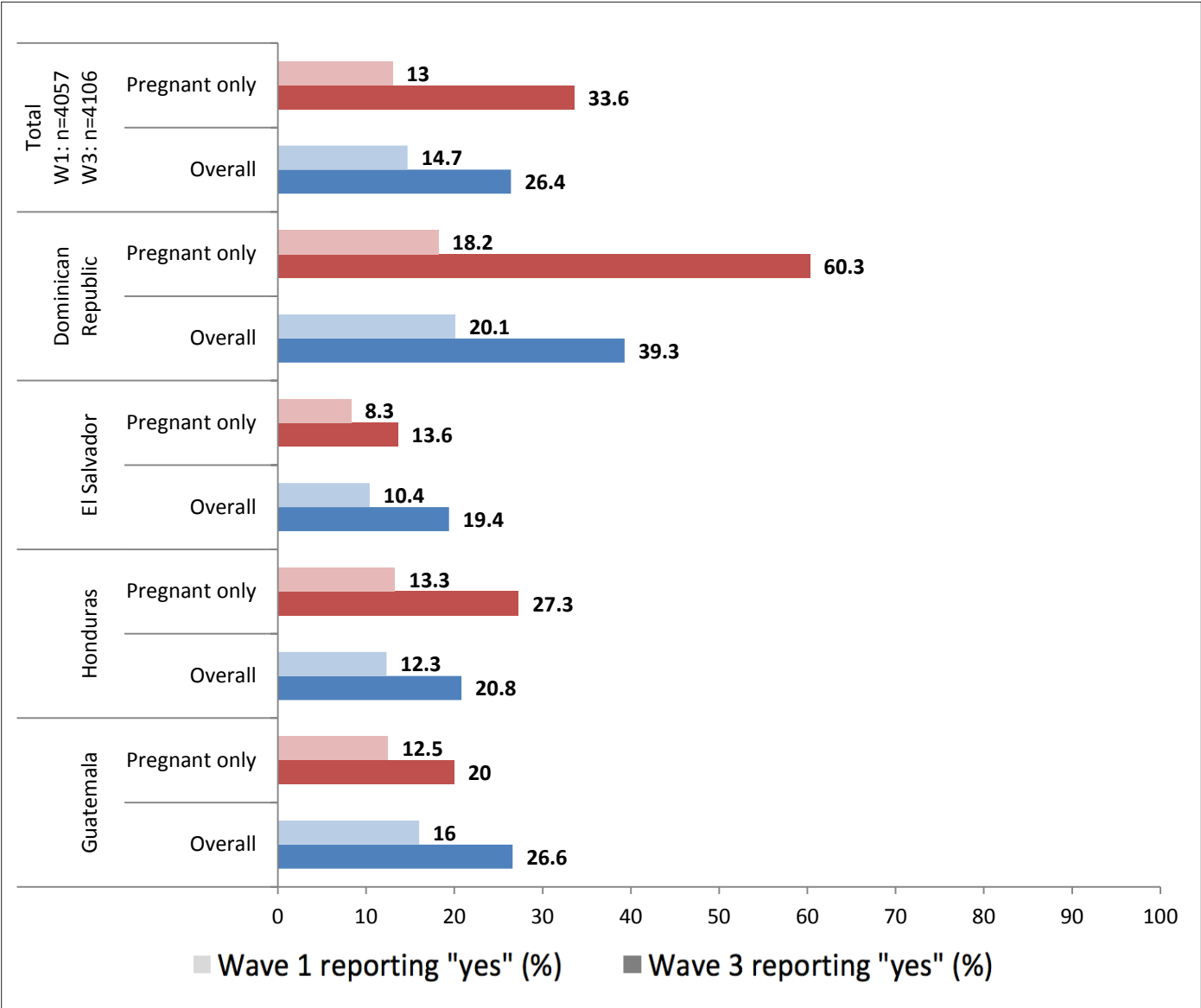
More than one quarter of women (25.3%) and men (27.7%) reported that screens on windows and doors will reduce the risk of Zika. Such knowledge was reported by a high percentage of women and men in the Dominican Republic (38.7% and 39.9% respectively) in wave 3.

Figure 49. Percentage of participants who reported that screens on windows and doors will reduce the risk of Zika (wave 1 vs. wave 3), by gender



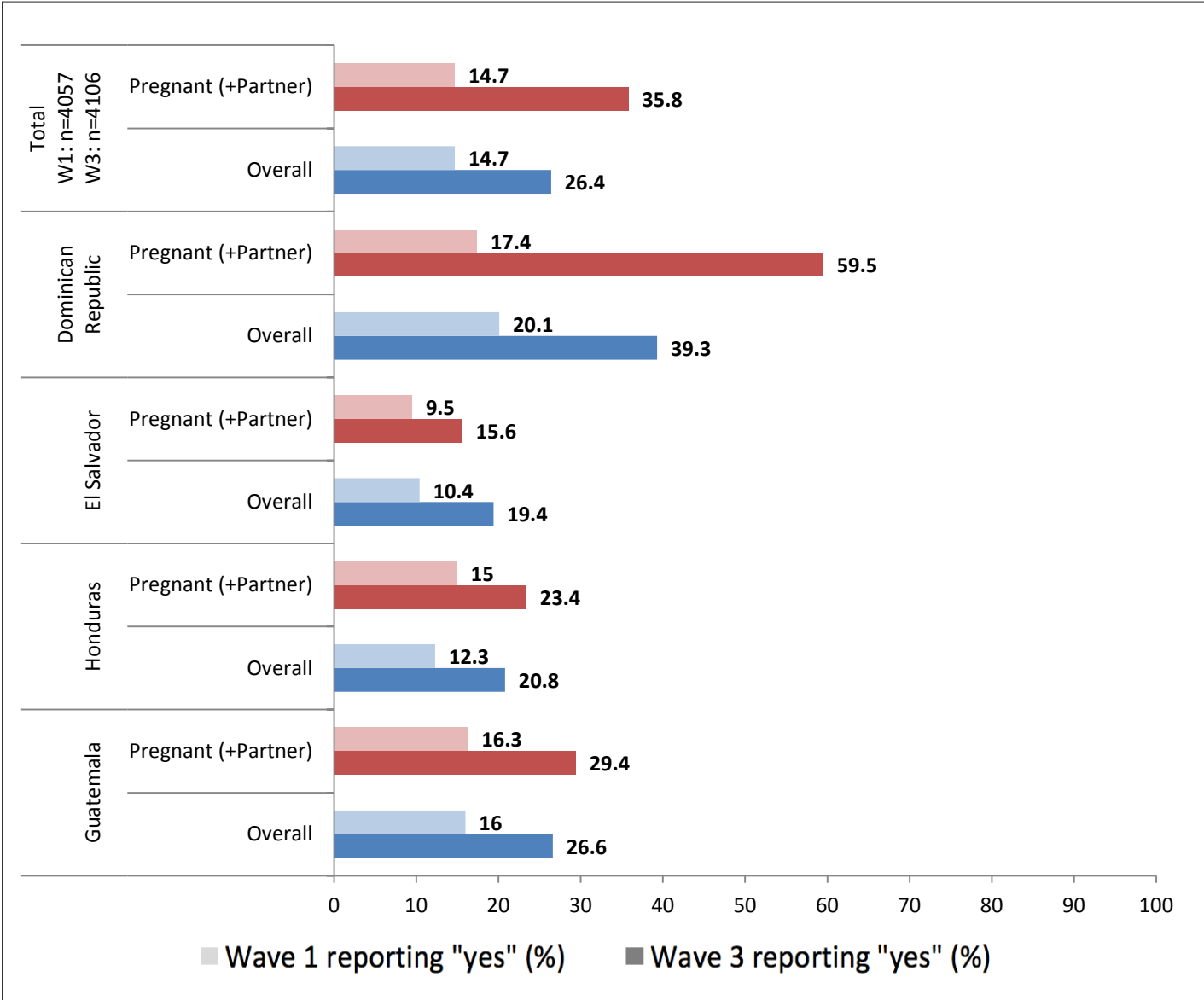
A larger percentage of participating pregnant women reported knowledge of screens as a Zika prevention strategy than did the sample overall in wave 3 (33.6% vs. 26.4%). More than half of pregnant women in the Dominican Republic reported knowledge of this prevention strategy (60.3%), while the percent with correct knowledge in other countries ranged from 13.6% to 27.3% for pregnant women.

Figure 50. Percentage of participants who reported that screens on windows and doors will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy status



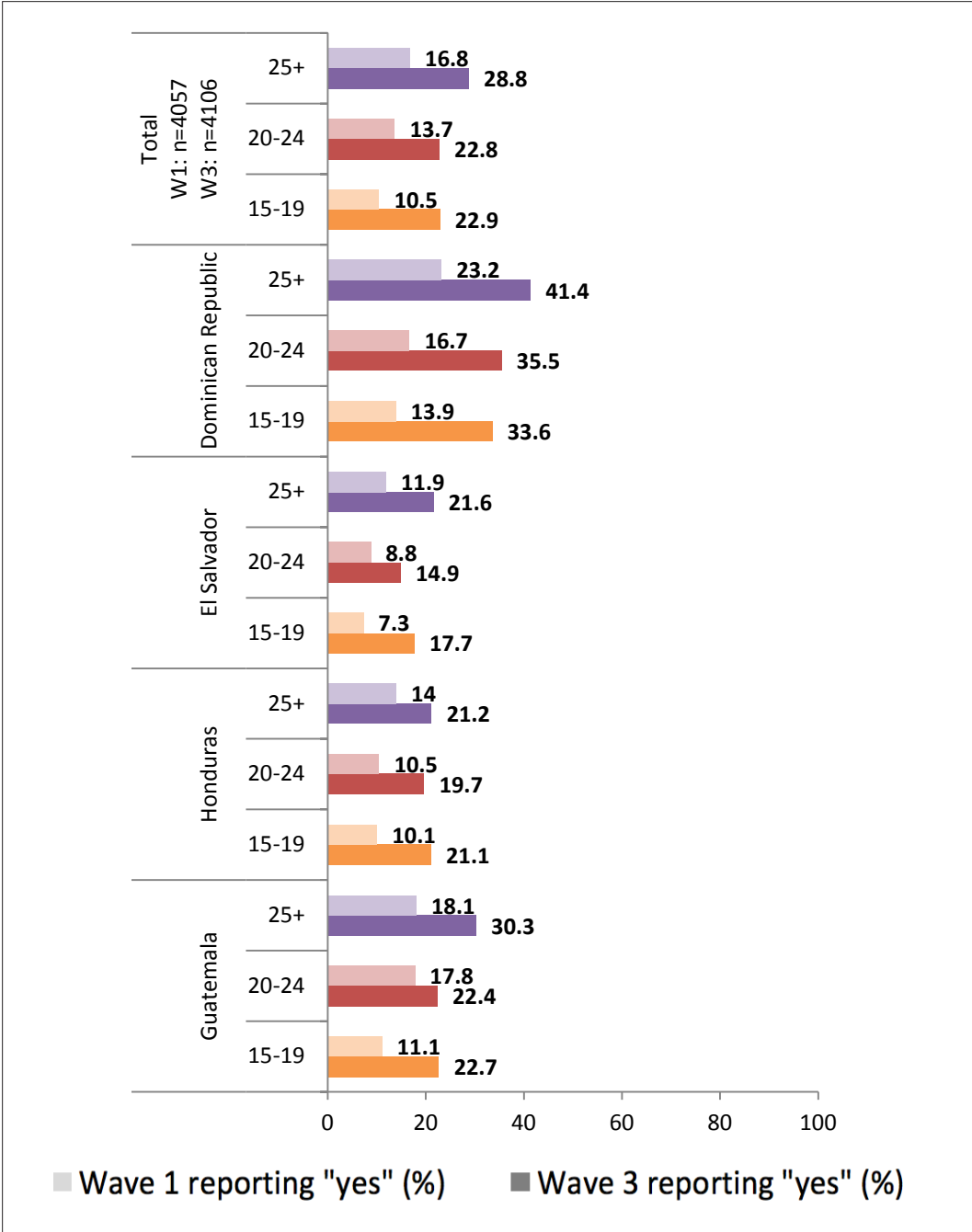
A larger percentage of participating pregnant women and males whose partners were pregnant reported knowledge of screens as a prevention strategy for Zika as compared to the overall sample, particularly in the Dominican Republic. The proportion with correct of knowledge was higher in wave 3 than in wave 1 across all countries, with El Salvador lowest (15.6%) and the Dominican Republic highest (59.5%) in wave 3.

Figure 51. Percentage of participants who reported that screens on windows and doors will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy/pregnant partner status



More adults 25 years and older had correct knowledge of screens as a prevention strategy for Zika than did younger age groups across all countries.

Figure 52. Percentage of participants who reported that screens on windows and doors will reduce the risk of Zika (wave 1 vs. wave 3), by age

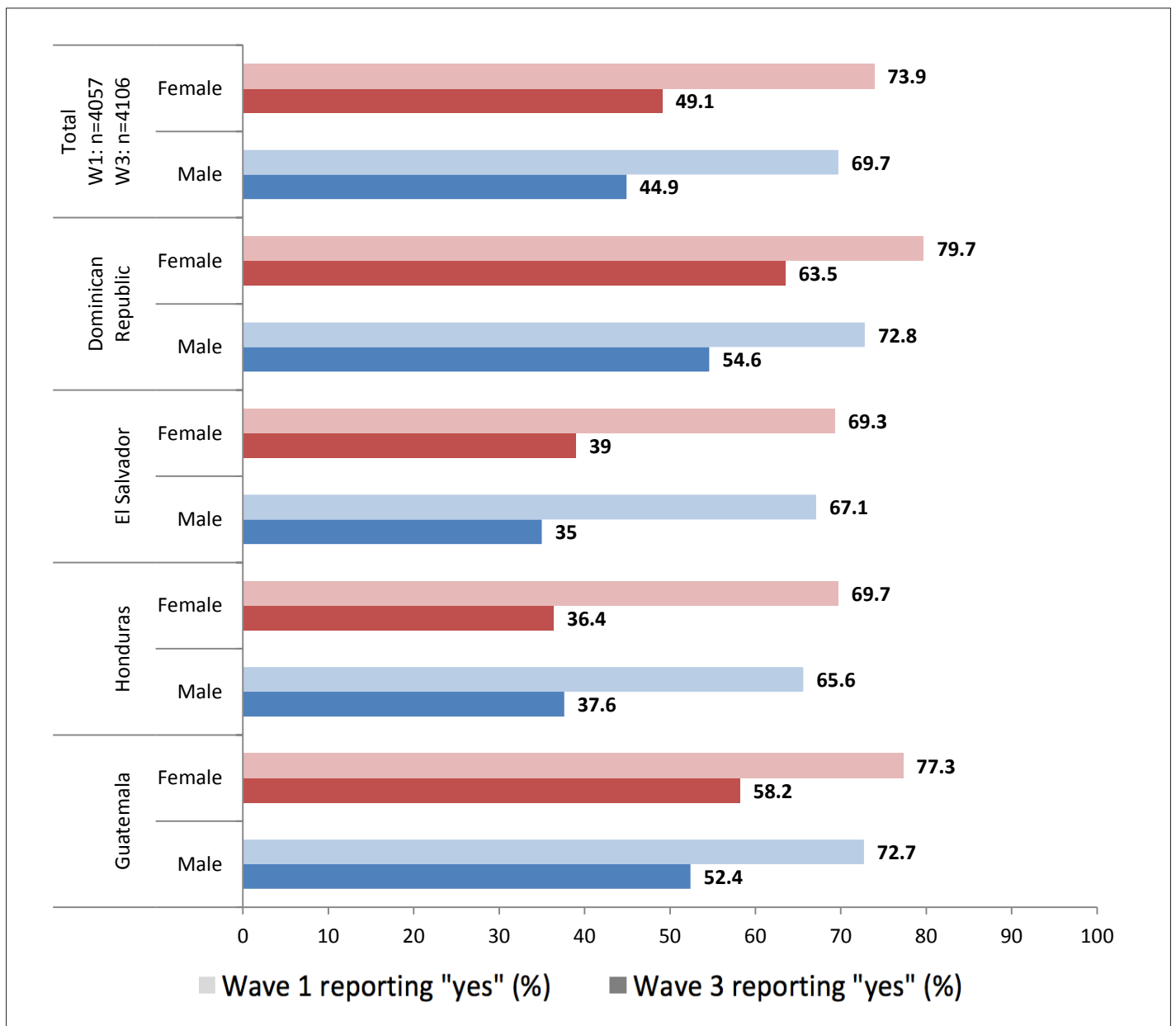


Knowledge that cleaning water containers will reduce the risk of Zika

The percentage of participants with correct knowledge that cleaning water containers will reduce the risk of Zika was significantly lower in wave 3 as compared to wave 1 ($p < 0.0001$). The percent with knowledge of this prevention strategy, in comparison to other prevention strategies asked about, was higher for women and men, pregnant women, and across all age groups in wave 1 as compared to wave 3.

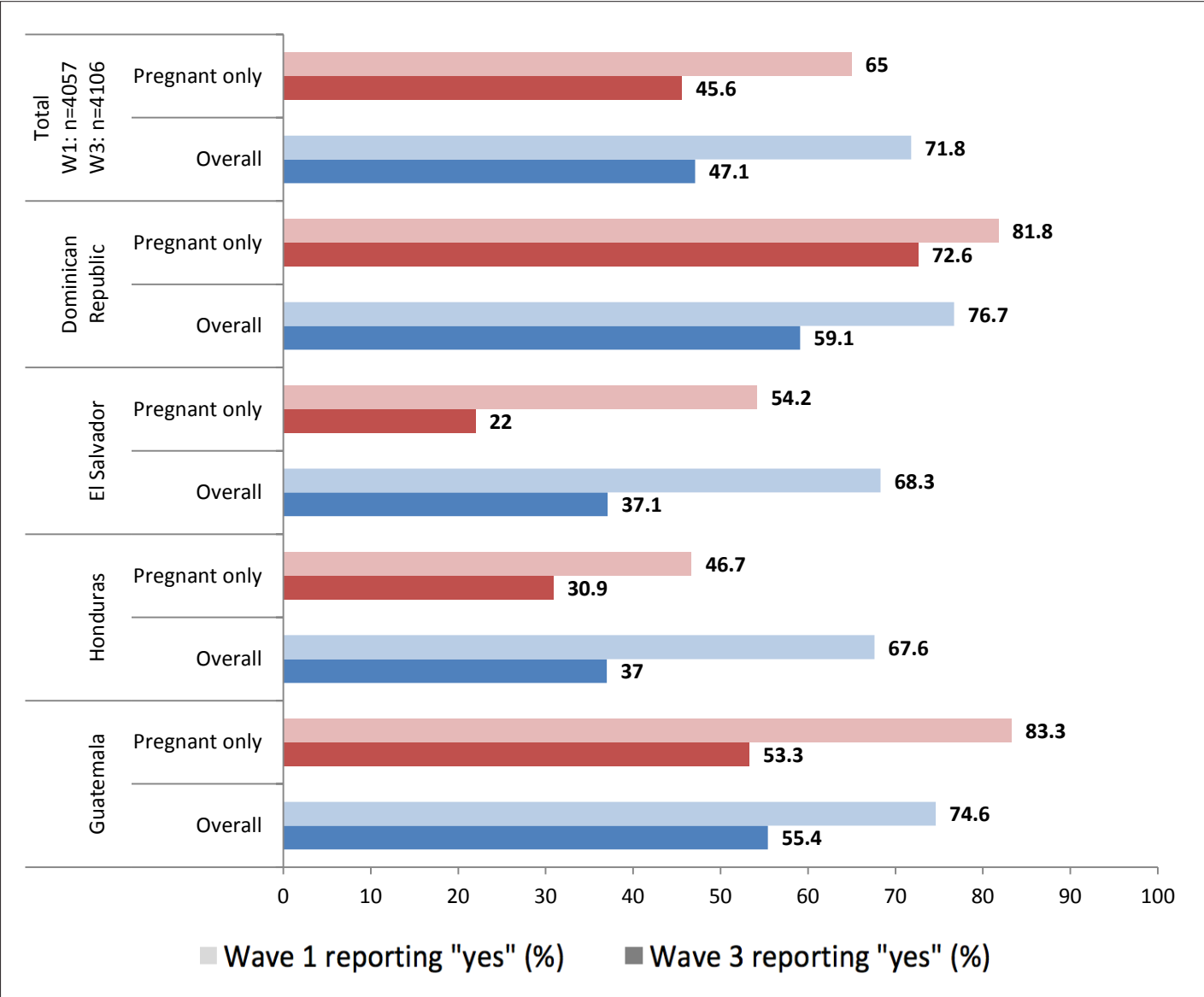
Higher proportions of women and men in wave 1 had correct knowledge that cleaning water containers was a prevention strategy for Zika (73.9% and 69.7% respectively), only 49.1% and 44.9% reported such knowledge in wave 3.

Figure 53. Percentage of participants who reported that cleaning water containers will reduce the risk of Zika (wave 1 vs. wave 3), by gender



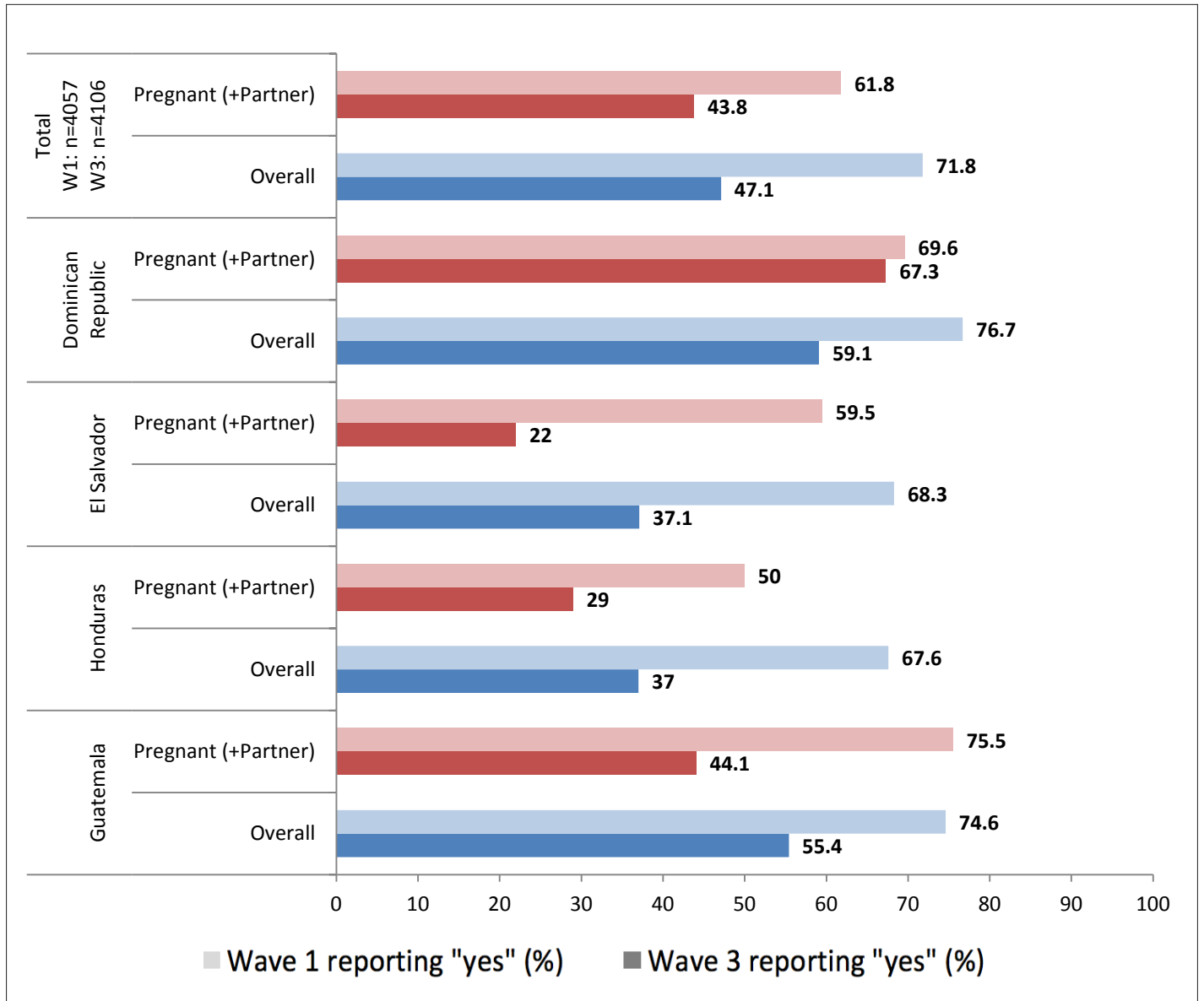
Among pregnant women, the percentage of participants reporting knowledge that cleaning water containers is a way to reduce the risk of Zika was highest in wave 3 among those in the Dominican Republic (72.6%). In contrast, El Salvador had lowest levels of knowledge of this prevention strategy (22.0%).

Figure 54. Percentage of participants who reported that cleaning water containers will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy status



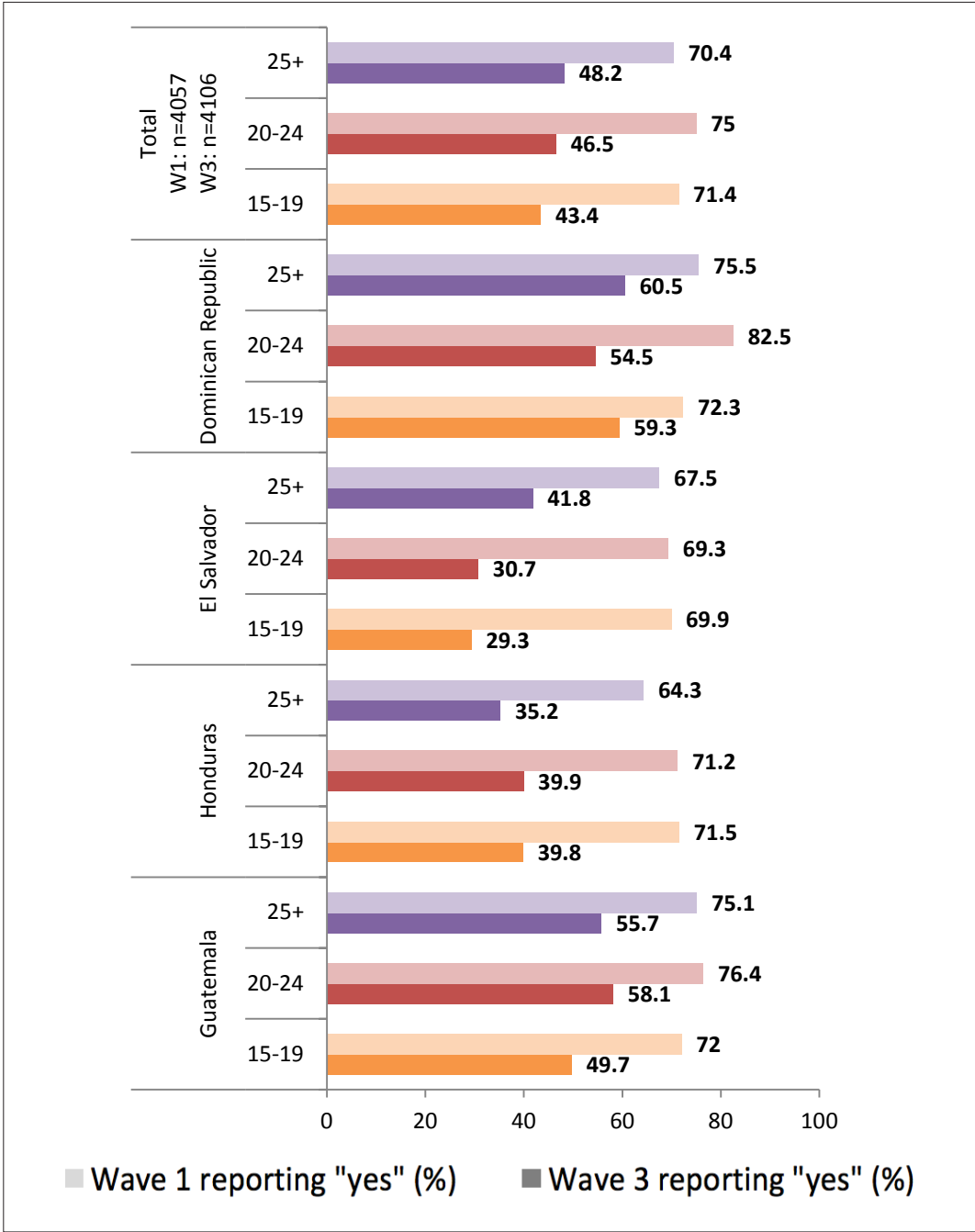
Trends were similar for participating pregnant women and males whose partners are pregnant, with fewer individuals having knowledge that cleaning water containers would reduce the risk of Zika lower in wave 3 than in wave 1.

Figure 55. Percentage of participants who reported that cleaning water containers will reduce the risk of Zika (wave 1 vs. wave 3), by pregnancy/pregnant partner status



Levels of knowledge that cleaning water containers will reduce the risk of Zika varied by age group in wave3, with adults 25 years and older having higher percent knowledge overall (48.2%) as well as in the Dominican Republic and El Salvador. In contrast, fewer adults in Honduras had correct knowledge of this prevention strategy as compared to other age groups in Honduras (35.2%).

Figure 56. Percentage of participants who reported that cleaning water containers will reduce the risk of Zika (wave 1 vs. wave 3), by age

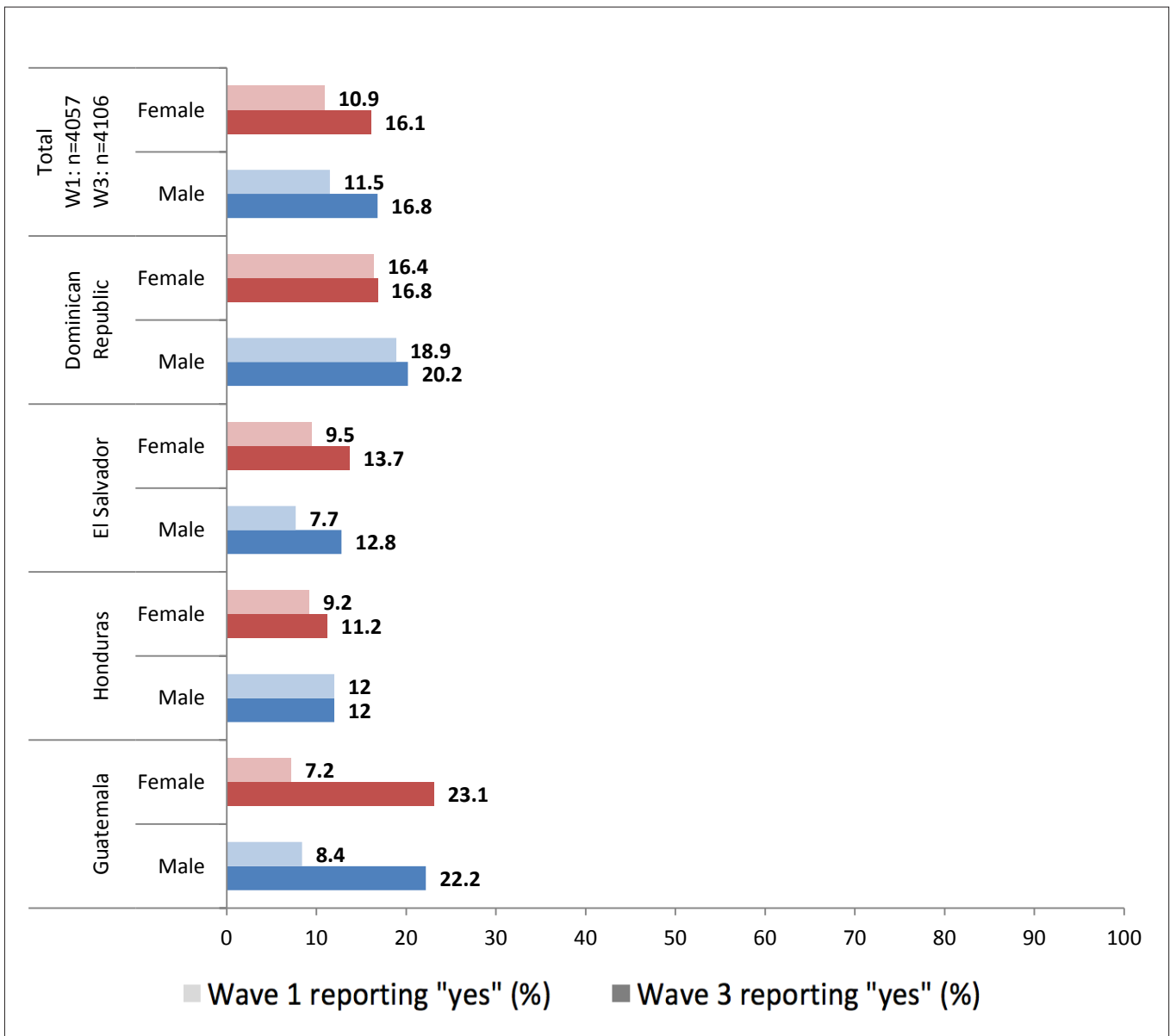


Knowledge that using a condom can prevent a pregnant person from getting Zika

The percentage of participants with knowledge that using a condom can prevent a pregnant person from getting Zika was significantly higher in wave 3 than in wave 1 overall ($p=0.0172$) and in Guatemala specifically ($p<0.0001$).

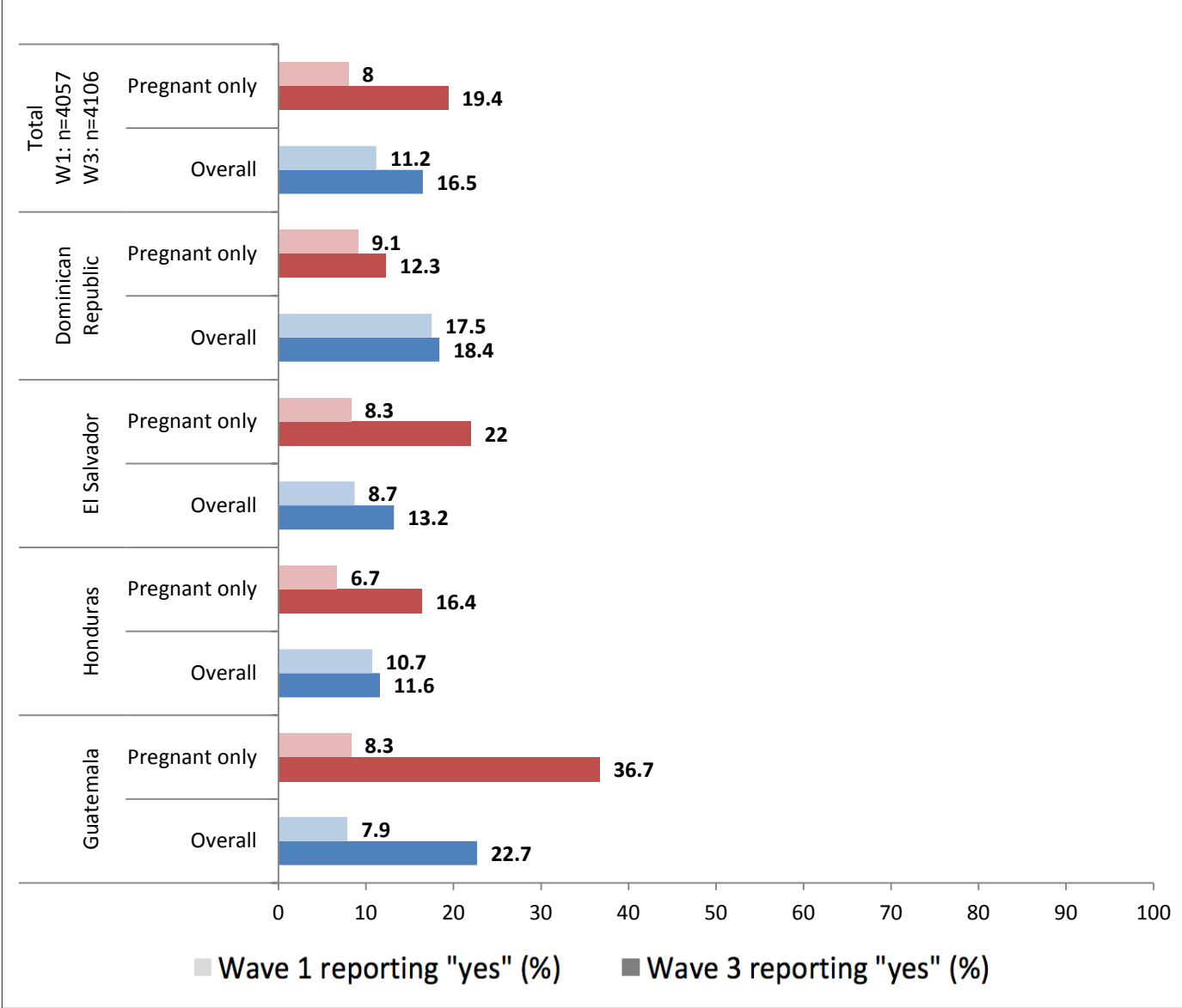
Nearly half of women (45.5%) and men (49.4%) in wave 3 reported that using a condom can prevent a pregnant person from getting Zika. The overall increase in the percent with knowledge that condoms can prevent pregnant women from getting Zika from wave 1 to wave 3 was not observed in all countries. In Honduras, for example, the percent with knowledge of this prevention strategy was lower in wave 3 as compared to wave 1 for both women and men.

Figure 57. Percentage of participants who reported that using a condom can prevent a pregnant person from getting Zika (wave 1 vs. wave 3), by gender



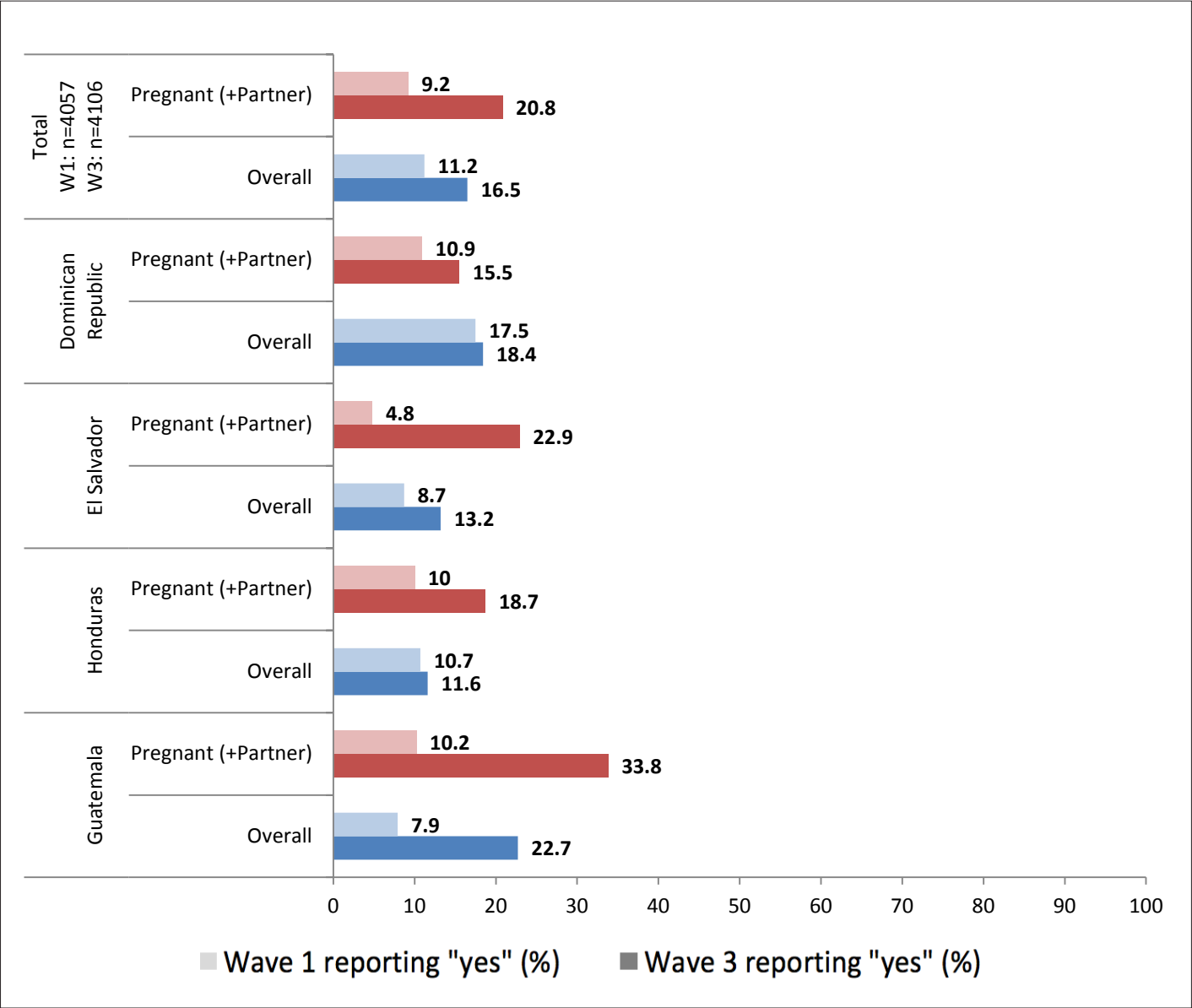
Among participating pregnant women, the percentage with knowledge that condom use can prevent a pregnant person from getting Zika increased from 51.5% to 61.8% from wave 1 to wave 3. The percentage of participants reporting such knowledge was higher among pregnant women than among the overall sample. More than 80% of pregnant women in the Dominican Republic (81.0%) reported knowing that using a condom can prevent a pregnant person from getting Zika.

Figure 58. Percentage of participants who reported that using a condom can prevent a pregnant person from getting Zika (wave 1 vs. wave 3), by pregnancy status



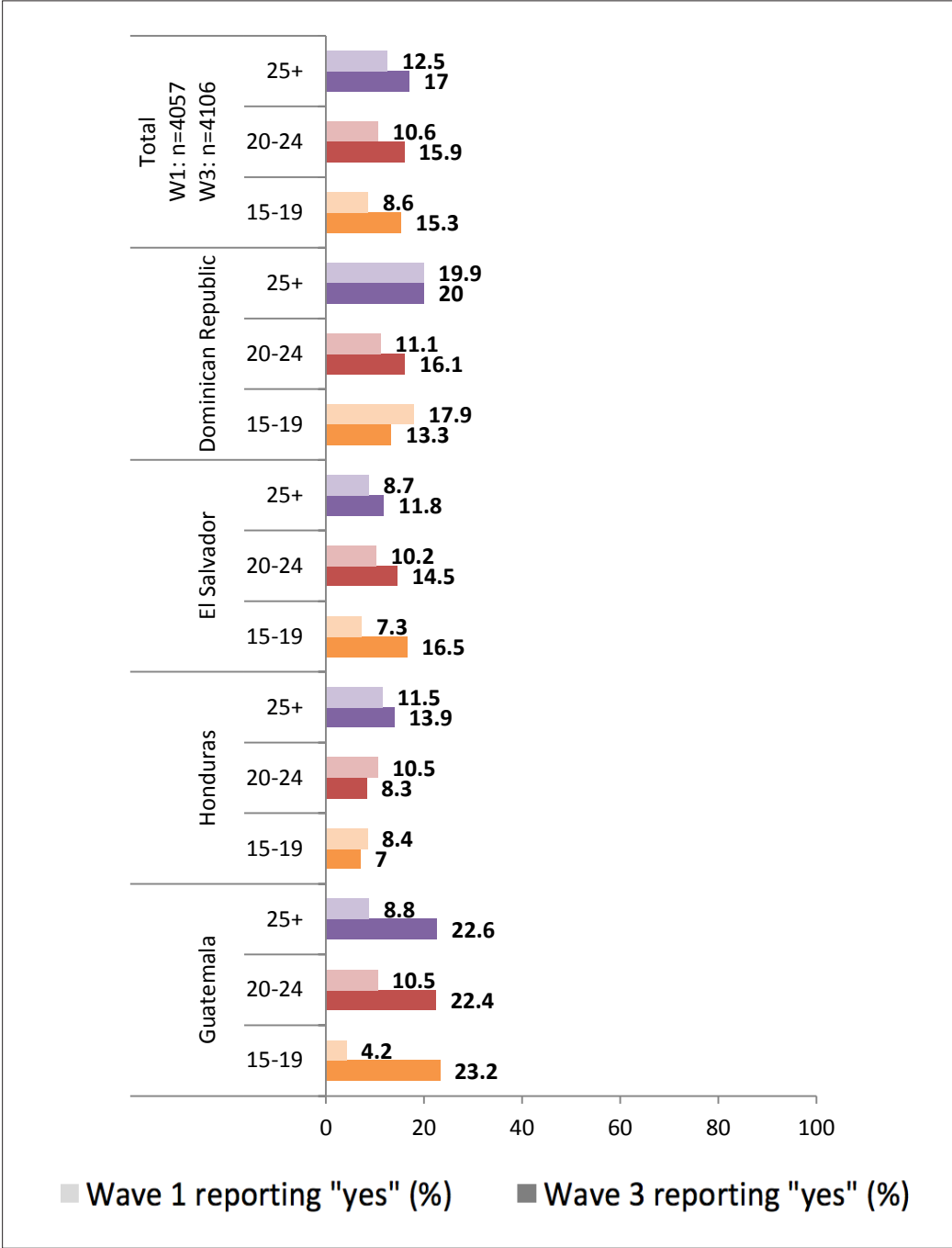
Similarly, a larger percentage of pregnant women and male whose partners were pregnant had knowledge about condoms as a Zika prevention strategy for pregnant women (61.6%) than the overall sample (47.5%) in wave 3. While the percent with knowledge was lower in wave 3 as compared to wave 1 for pregnant women and partners in Honduras, the opposite was true in the other three countries.

Figure 59. Percentage of participants who reported that using a condom can prevent a pregnant person from getting Zika (wave 1 vs. wave 3), by pregnancy/pregnant partner status



The percentage of participants with correct knowledge that using a condom can prevent a pregnant person from getting Zika was similar across age groups, with higher proportions of adolescents and youth generally having correct knowledge of this prevention strategy than adults 25 years and older.

Figure 60. Percentage of participants who reported that using a condom can prevent a pregnant person from getting Zika (wave 1 vs. wave 3), by age



Zika-Related Behaviors and Self-action

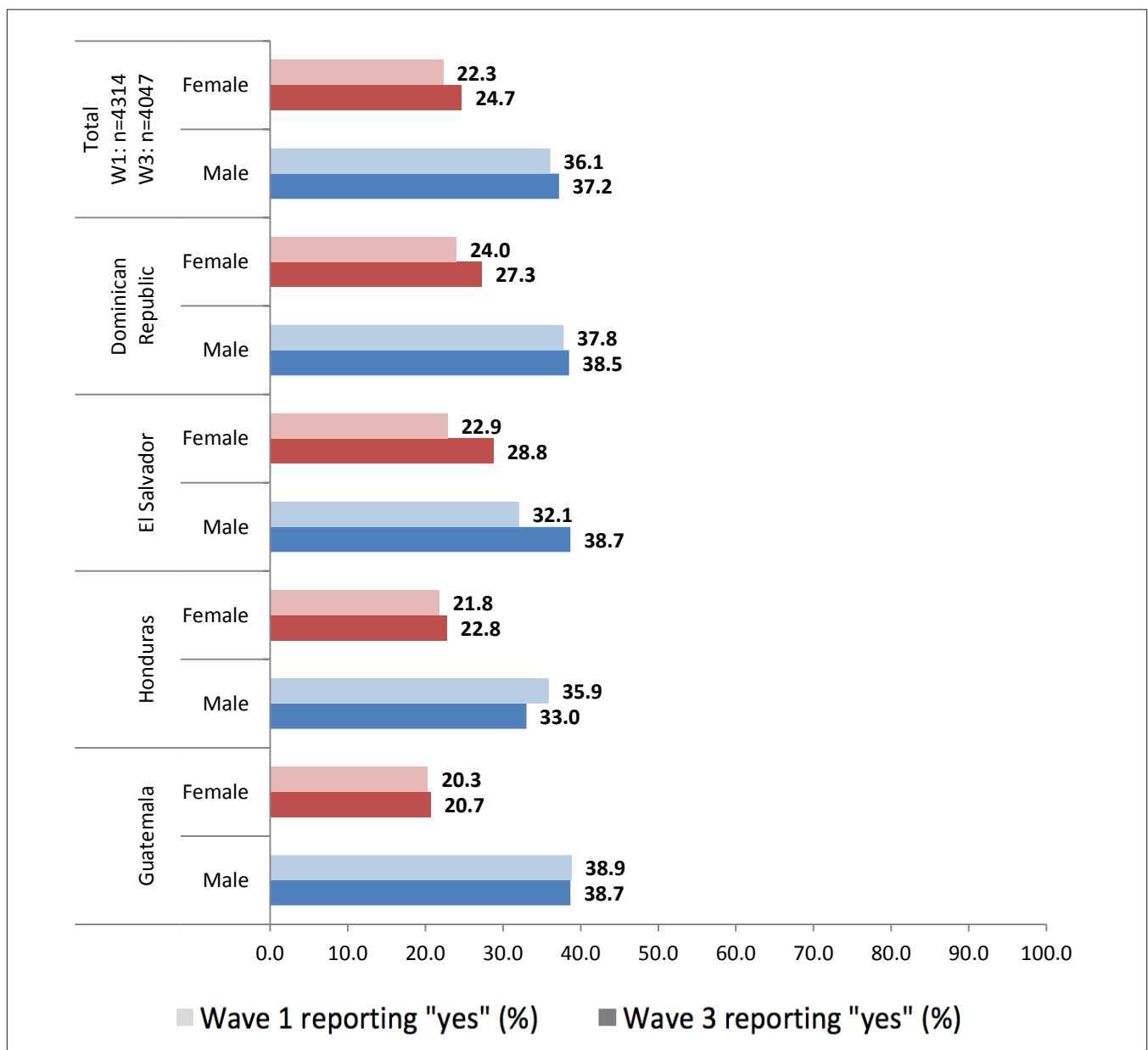
Use of condoms to prevent Zika

Participant reports of condom use within the last month to prevent Zika are presented below.

There were no significant positive differences in use of condoms to prevent Zika in the last month between wave 1 and wave 3 overall or in three of the four countries. In contrast, condom use to prevent Zika was significantly higher in wave 3 than in wave 1 in El Salvador ($p=0.0008$).

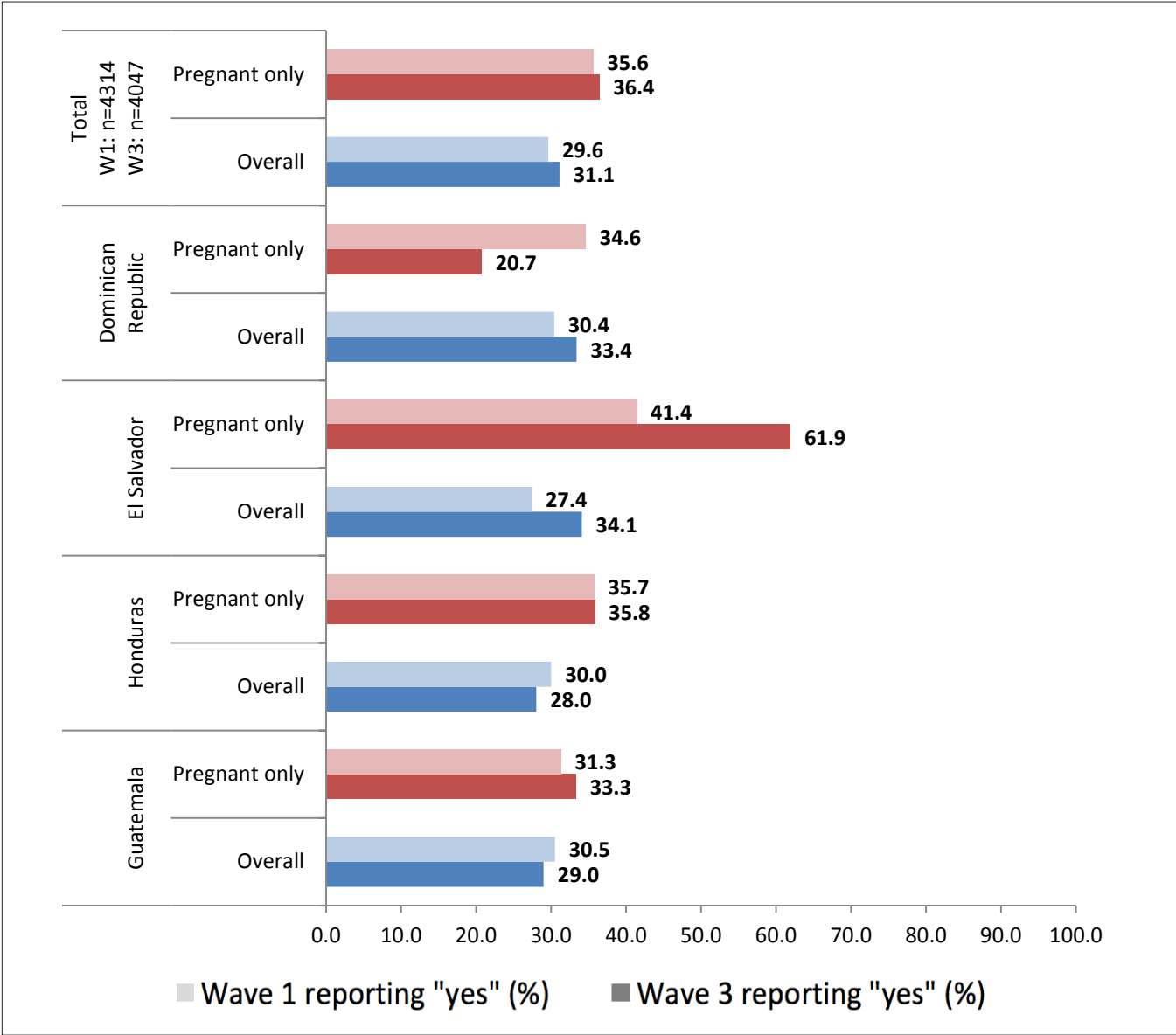
Overall, percentage of participants reporting use of condoms to prevent Zika was higher for women (24.7%) as well as men (37.2%) in wave 3 as compared to wave 1. More men reported, as expected, use of condoms in the last month as compared to women in wave 3. Condom use in Guatemala in particular showed only slight changes between wave 1 and wave 3 for women and men.

Figure 61. Percentage of participants who used a condom to prevent Zika in the last month (wave 1 vs. wave 3), by gender



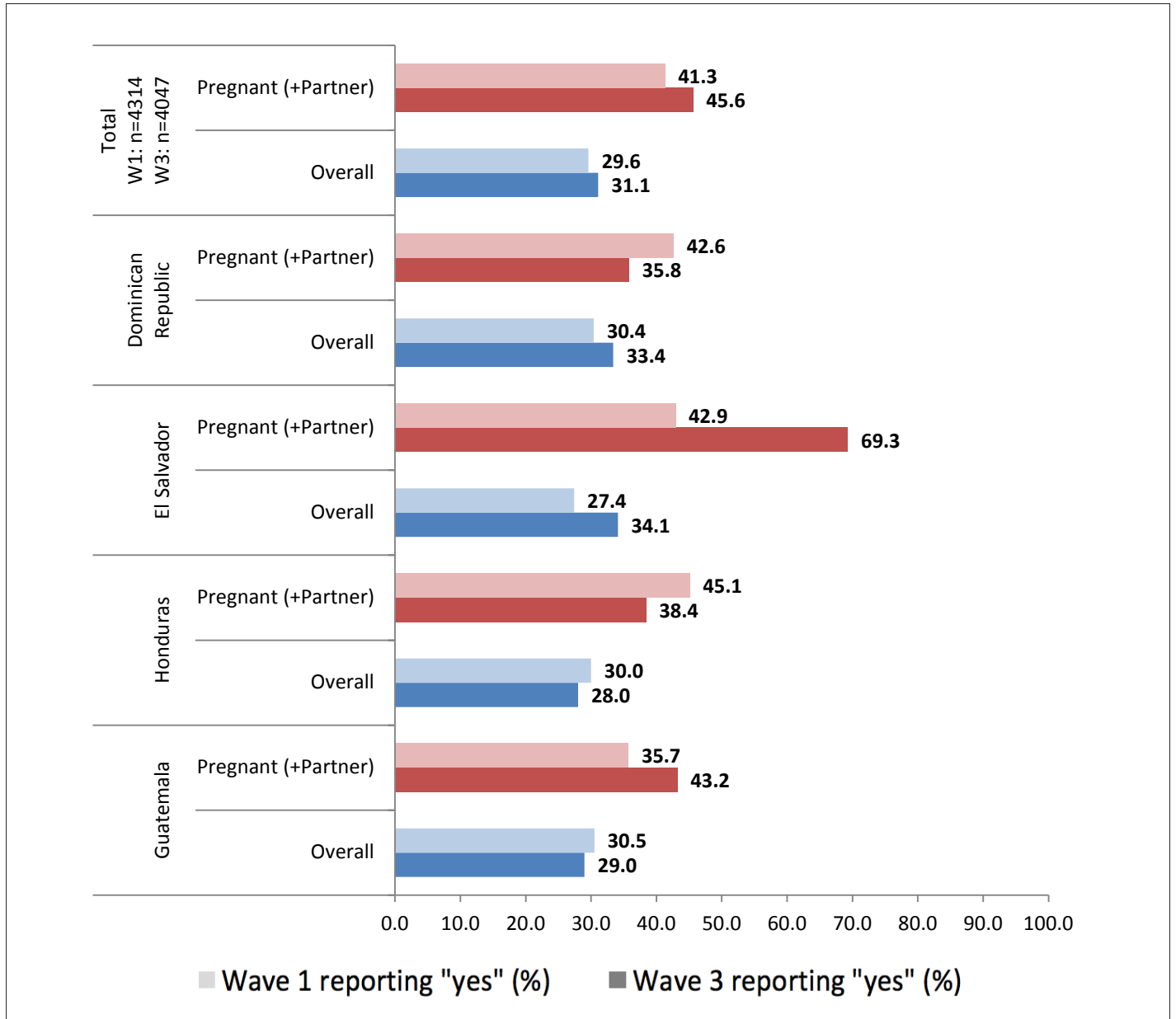
More than 60% of participating pregnant women in El Salvador (61.9%) reported having used a condom to prevent Zika in the last month as compared to only 41.4% in wave 1. In contrast, fewer pregnant women in the Dominican Republic reported recent condom use in wave 3 (20.7%) as compared to wave 1 (34.6%).

Figure 62. Percentage of participants who used a condom to prevent Zika in the last month (wave 1 vs. wave 3), by pregnancy status



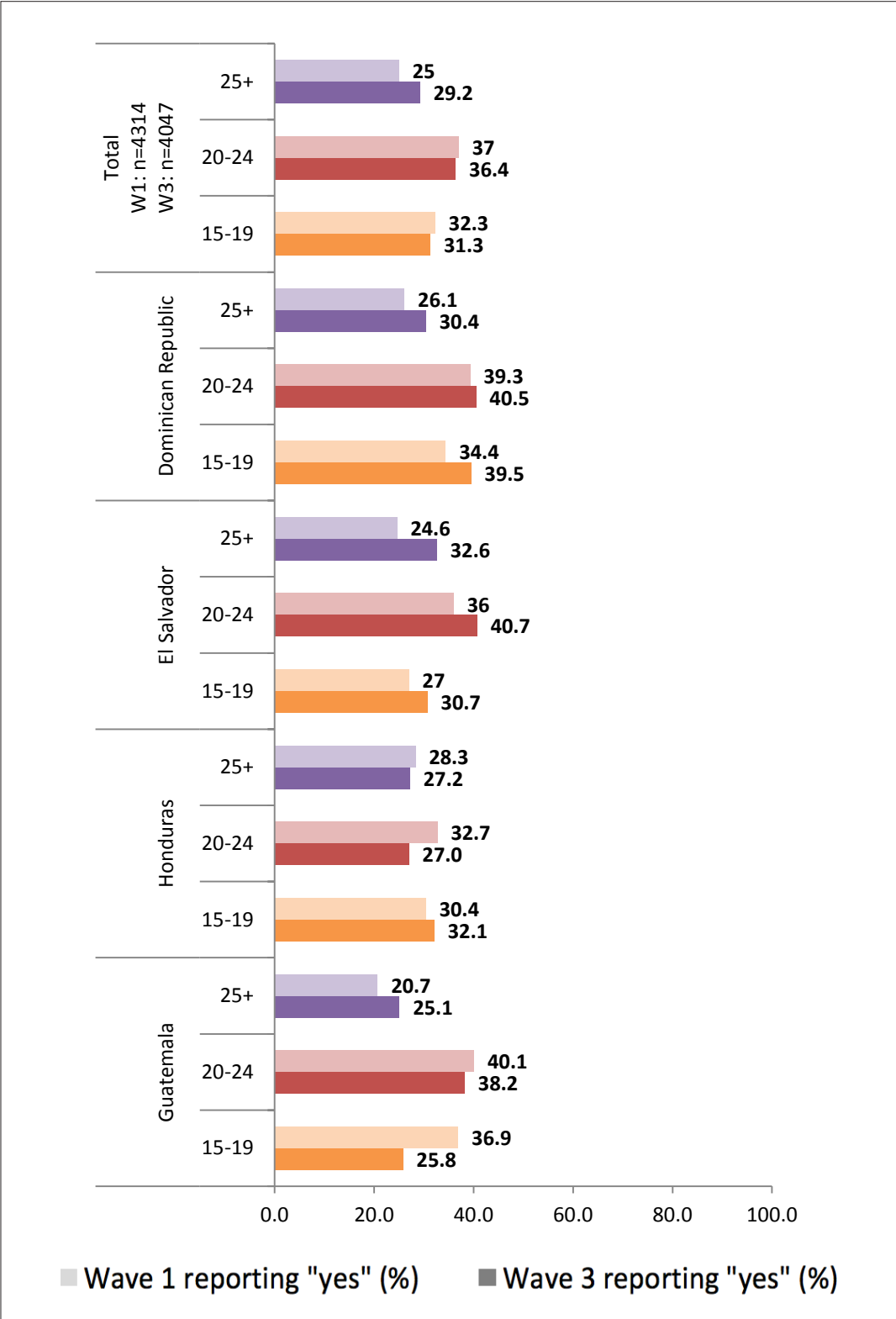
Participating pregnant women and partners of pregnant women showed similar trends in condom use to prevent Zika in the last month, with nearly 70% (69.3%) of pregnant women and males whose partners were pregnant reporting this prevention strategy in the last month in wave 3. In contrast, a smaller percentage of this population reported this self-action in wave 1 in both the Dominican Republic and Honduras.

Figure 63. Percentage of participants who used a condom to prevent Zika in the last month (wave 1 vs. wave 3), by pregnancy/partner pregnant status



More youth reported recent condom use to prevent Zika than did other age groups overall as well as in the Dominican Republic (40.5%), El Salvador (40.7%), and Guatemala (38.2%) in wave 3. In contrast, fewer adults 25 years and older reported recent condom use to prevent Zika in the last month as compared to younger groups.

Figure 64. Percentage of participants who used a condom to prevent Zika in the last month (wave 1 vs. wave 3), by age

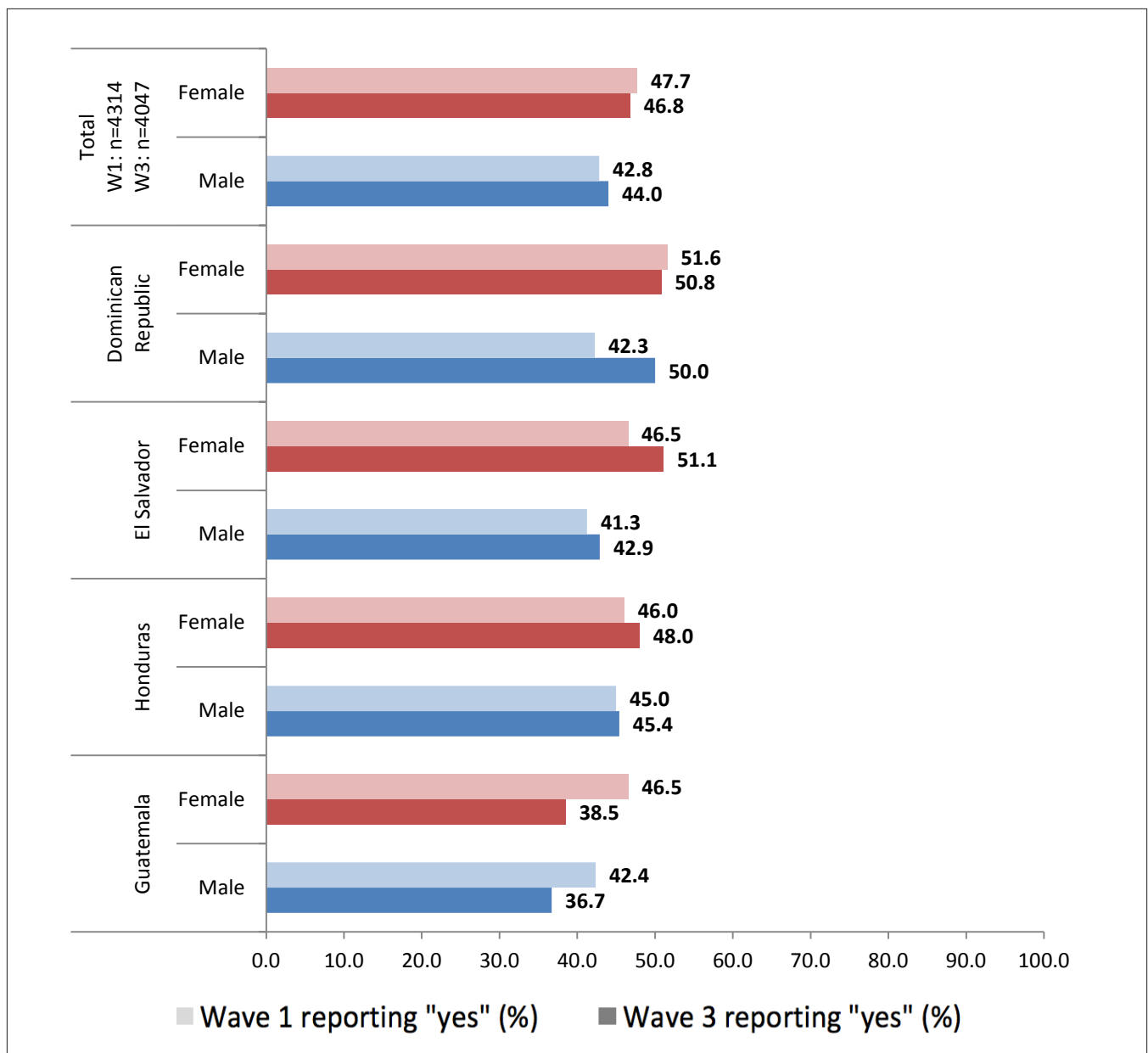


Use of mosquito repellent to prevent Zika

Participants' use of mosquito repellent to prevent Zika in the last month is shown below. There were no significant positive differences in the percentage of participants reporting use of mosquito repellent to prevent Zika between wave 1 and wave 3. In contrast, there was a significant negative difference in the percentage of participants reporting this practice in Guatemala between wave 1 (44.2%) and wave 3 (37.7%) ($p=0.0025$).

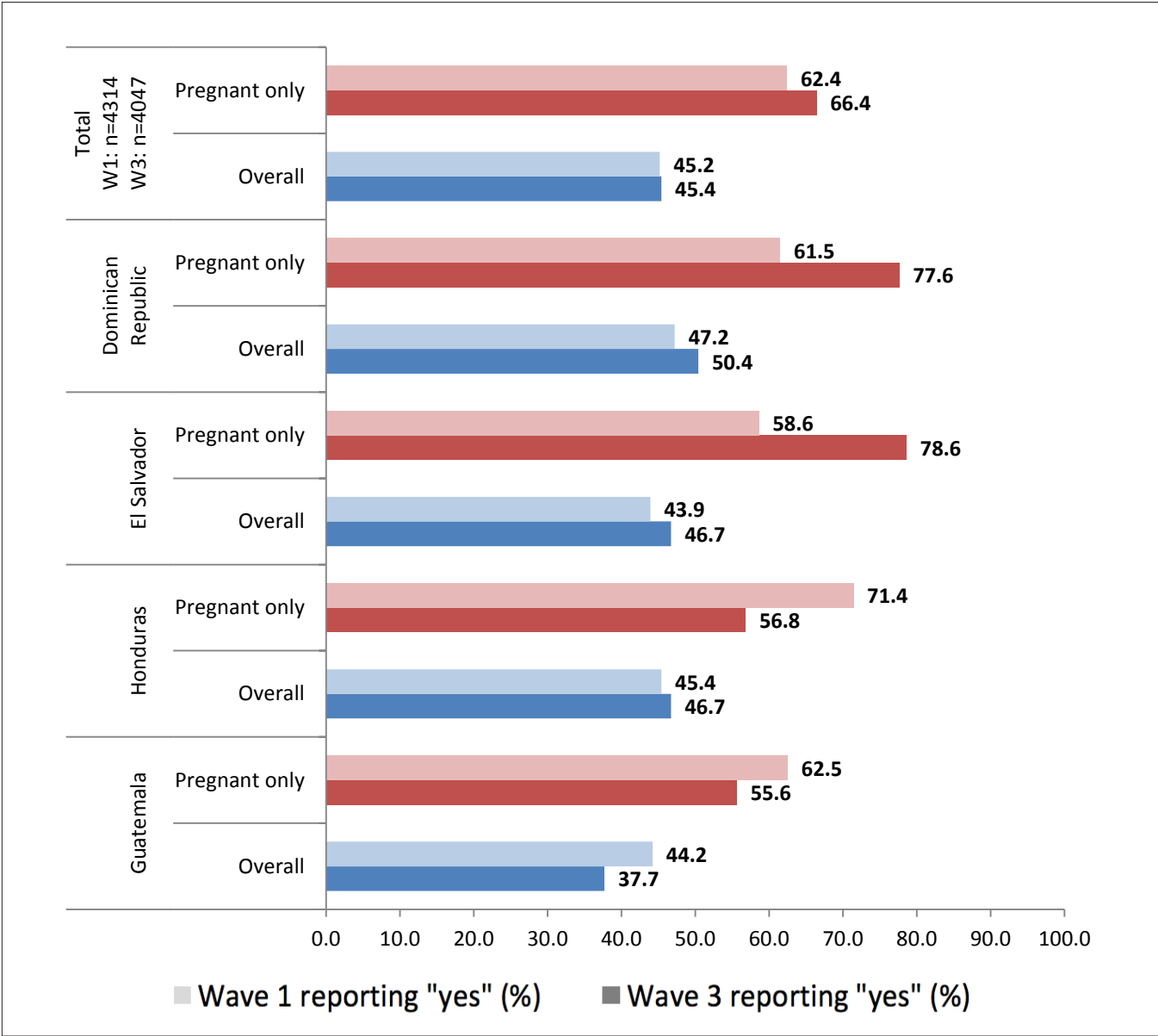
Overall, trends in the use of mosquito repellent to prevent Zika between wave 1 and wave 3 varied for women and men in each of the four countries. While more women in El Salvador and Honduras reported using mosquito repellent in wave 3 (51.1% and 48.0% respectively) as compared to wave 1, the opposite was true in the Dominican Republic and Guatemala.

Figure 65. Percentage of participants who used mosquito repellent to prevent Zika in the last month (wave 1 vs. wave 3), by gender



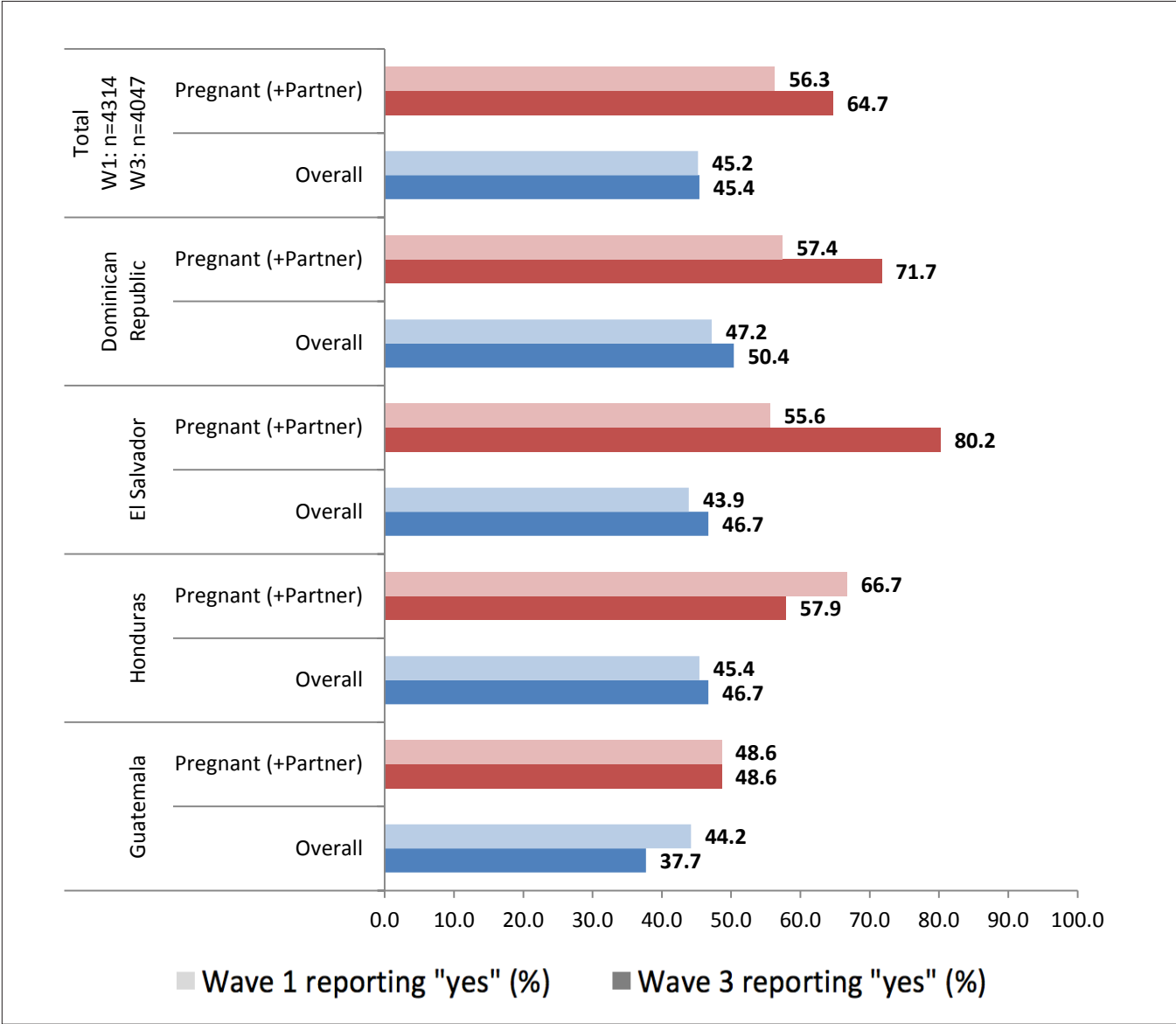
Among participating pregnant women, the percentage reporting use of mosquito repellent to prevent Zika in the last month was higher in wave 3 than in wave 1 both overall (66.4% vs. 62.4%) as well as in the Dominican Republic (77.6% vs. 61.5%) and El Salvador (78.6% vs. 58.6%). In contrast, fewer pregnant women in Honduras and Guatemala reported use of mosquito repellent in wave 3 as compared to wave 1.

Figure 66. Percentage of participants who used mosquito repellent to prevent Zika in the last month (wave 1 vs. wave 3), by pregnancy status



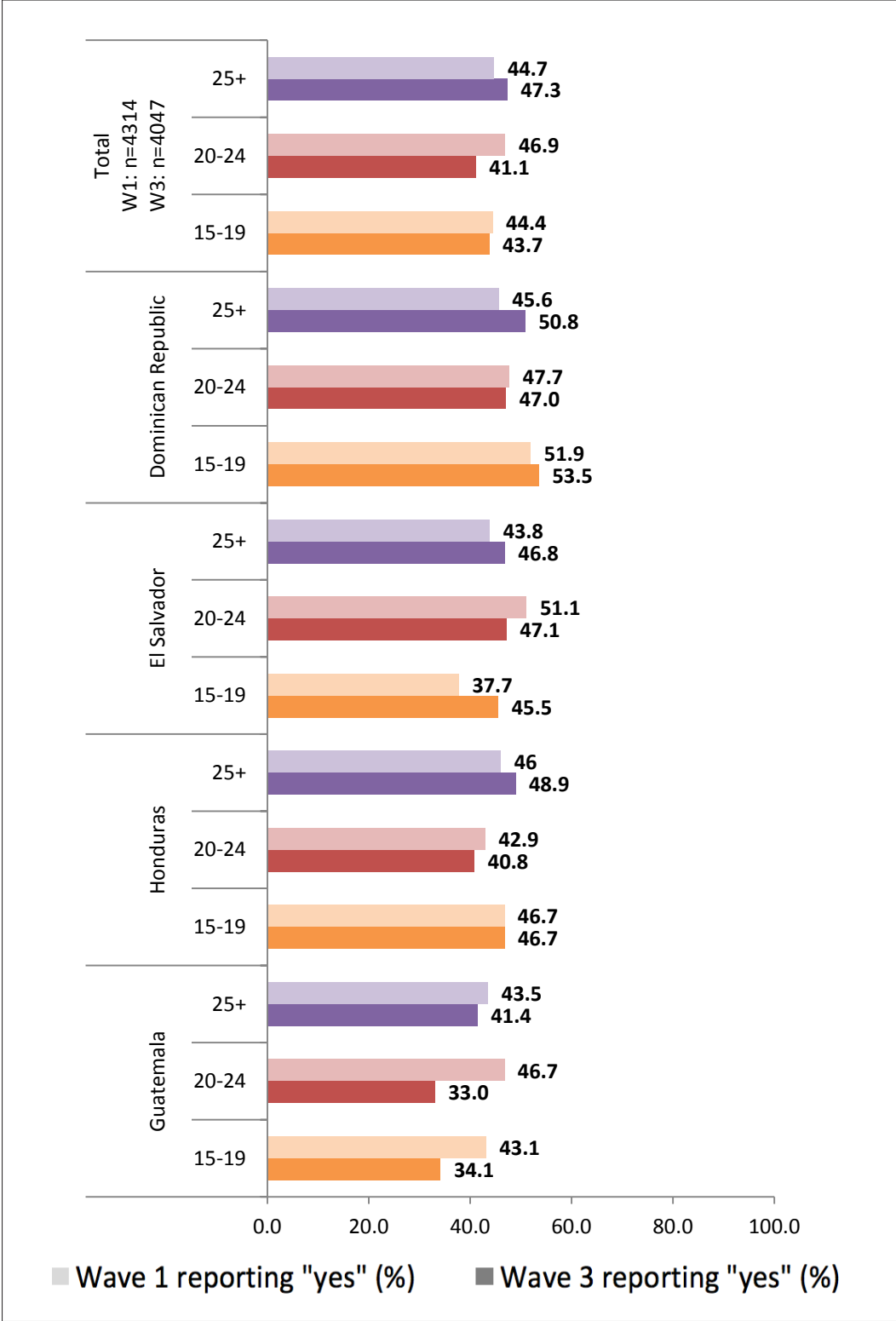
Among participating pregnant women and male partners of pregnant women, the percent that used mosquito repellent as a prevention strategy was higher in wave 3 as compared to wave 1 in the Dominican Republic and El Salvador as well as overall. Only in Honduras was there evidence that the percentage of participants reporting this prevention behavior was lower in wave 3 (57.9%) vs. wave 1 (66.7%).

Figure 67. Percentage of participants who used mosquito repellent to prevent Zika in the last month (wave 1 vs. wave 3), by pregnancy/pregnant partner status



Use of mosquito repellent to prevent Zika also varied by age across each of the four countries. While a larger percentage of adults 25 years and older in Honduras and Guatemala reported this prevention behavior (48.9% and 41.4% respectively) in wave 3, younger age groups in the Dominican Republic and El Salvador had higher percentages of participants reporting use of mosquito repellent to prevent Zika in wave 3.

Figure 68. Percentage of participants who used mosquito repellent to prevent Zika in the last month (wave 1 vs. wave 3), by age

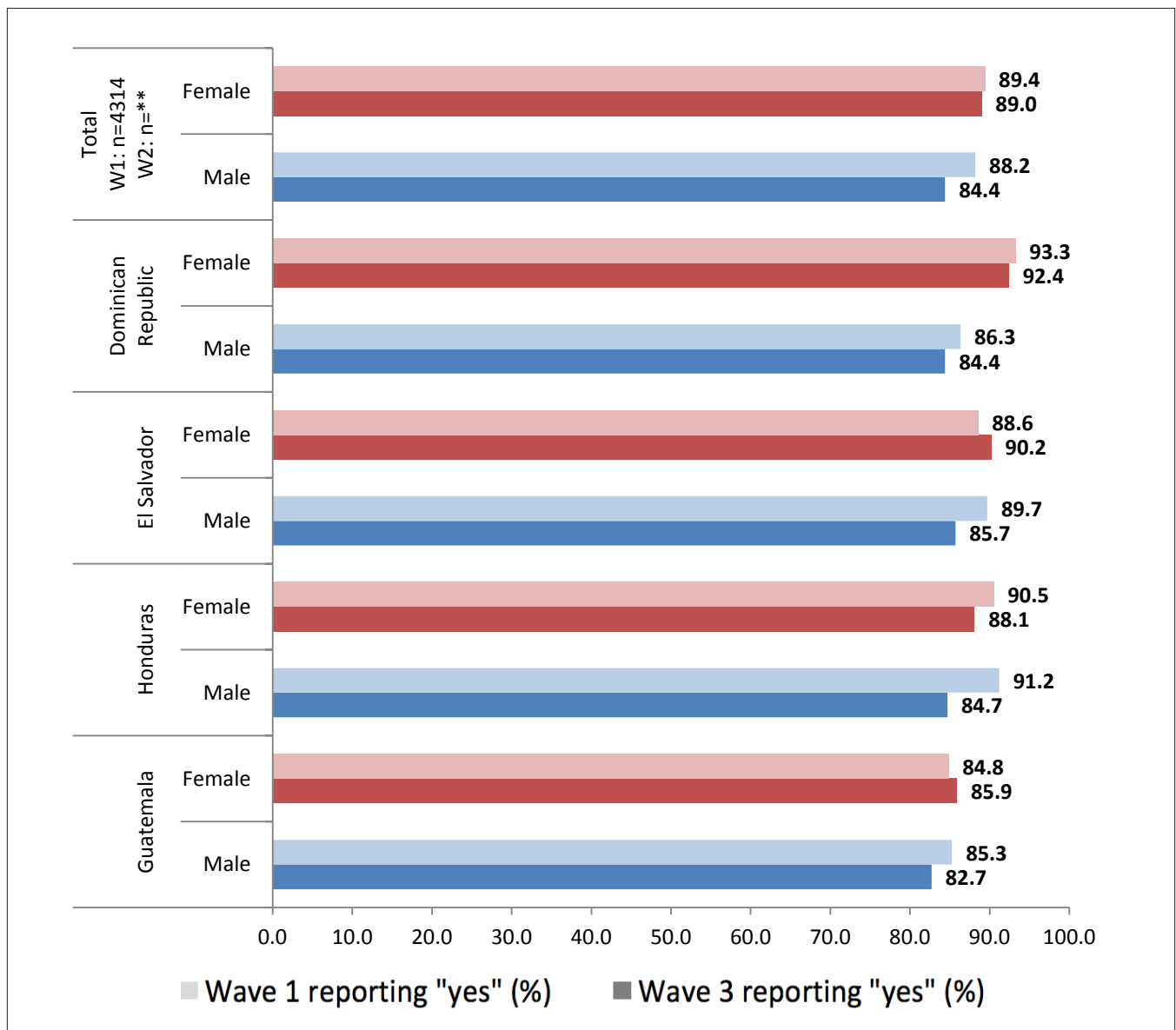


Elimination of standing water or scrubbing water containers to prevent Zika

Participants described whether they had, in the last month, eliminated standing water or scrubbed water containers to prevent Zika. There was no significant increase in the percentage of participants reporting elimination of standing water or scrubbing water containers to prevent Zika in the last month between wave 2 and wave 3 overall. In contrast, there was a significant decrease in the percentage of participants reporting this prevention behavior in El Salvador between wave 2 (90.9%) and wave 3 (87.8%) ($p=0.024$).

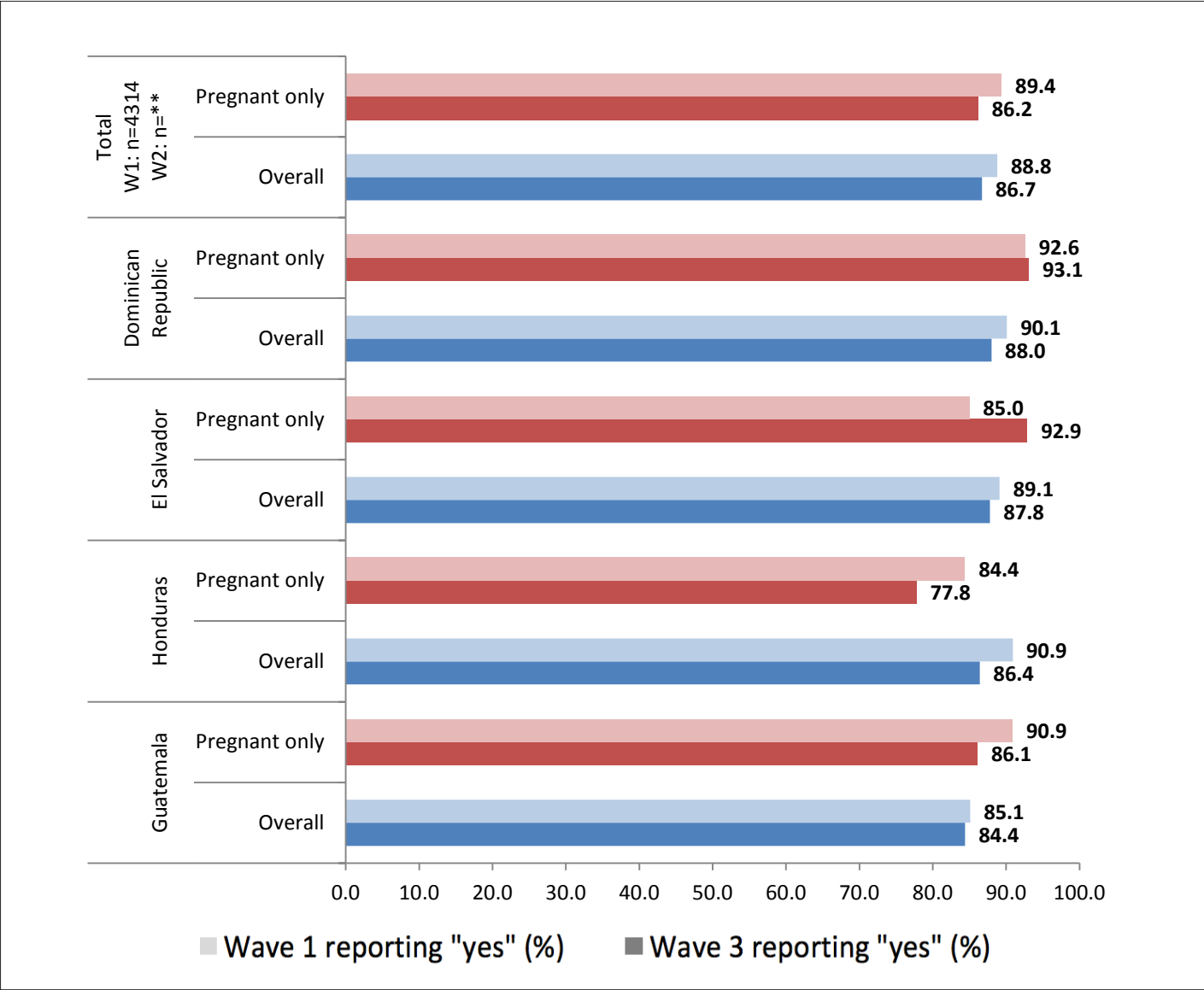
Overall, there was little difference between percentage of participants having recently eliminated standing water or scrubbing of water containers between wave 2 and wave 3. In fact, overall slightly smaller percentages of women and men (except among women in El Salvador and Guatemala) reported such behavior in wave 3 as compared to wave 2. However, a higher percentage of participants reported this practice (89.0% for women, 84.4% for men) among participants in wave 3.

Figure 69. Percentage of participants who eliminated standing water or scrubbed water containers to prevent Zika in the last month (wave 2 vs. wave 3), by gender



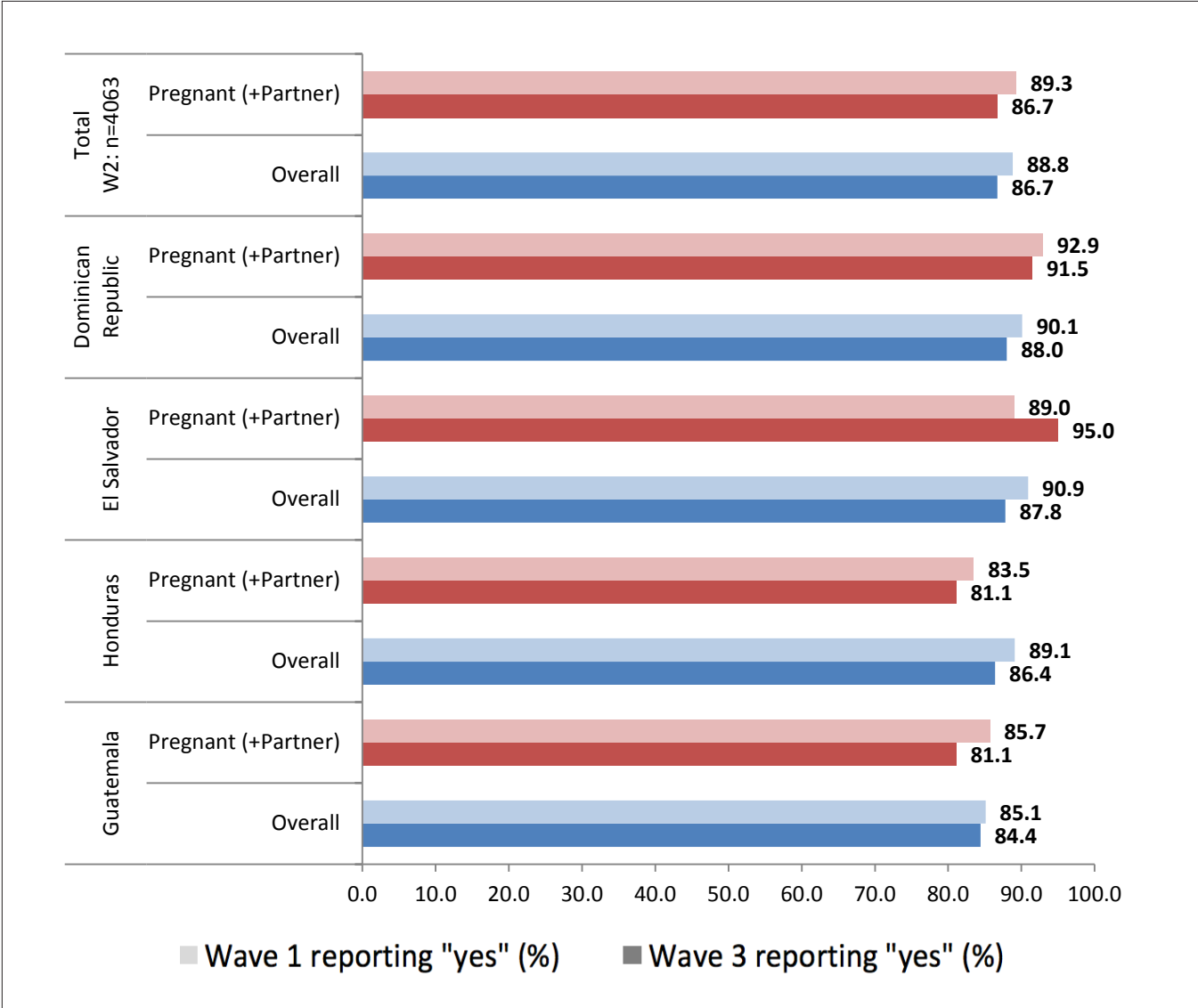
In wave 3, more participating pregnant women reported elimination of standing water or scrubbing water containers to prevent Zika in the last month in the Dominican Republic (93.1%) and El Salvador (92.9%). In contrast, the percentage of pregnant women engaging in this behavior was lower than the overall population in Honduras and Guatemala.

Figure 70. Percentage of participants who eliminated standing water or scrubbed water containers to prevent Zika in the last month (wave 2 vs. wave 3), by pregnancy status



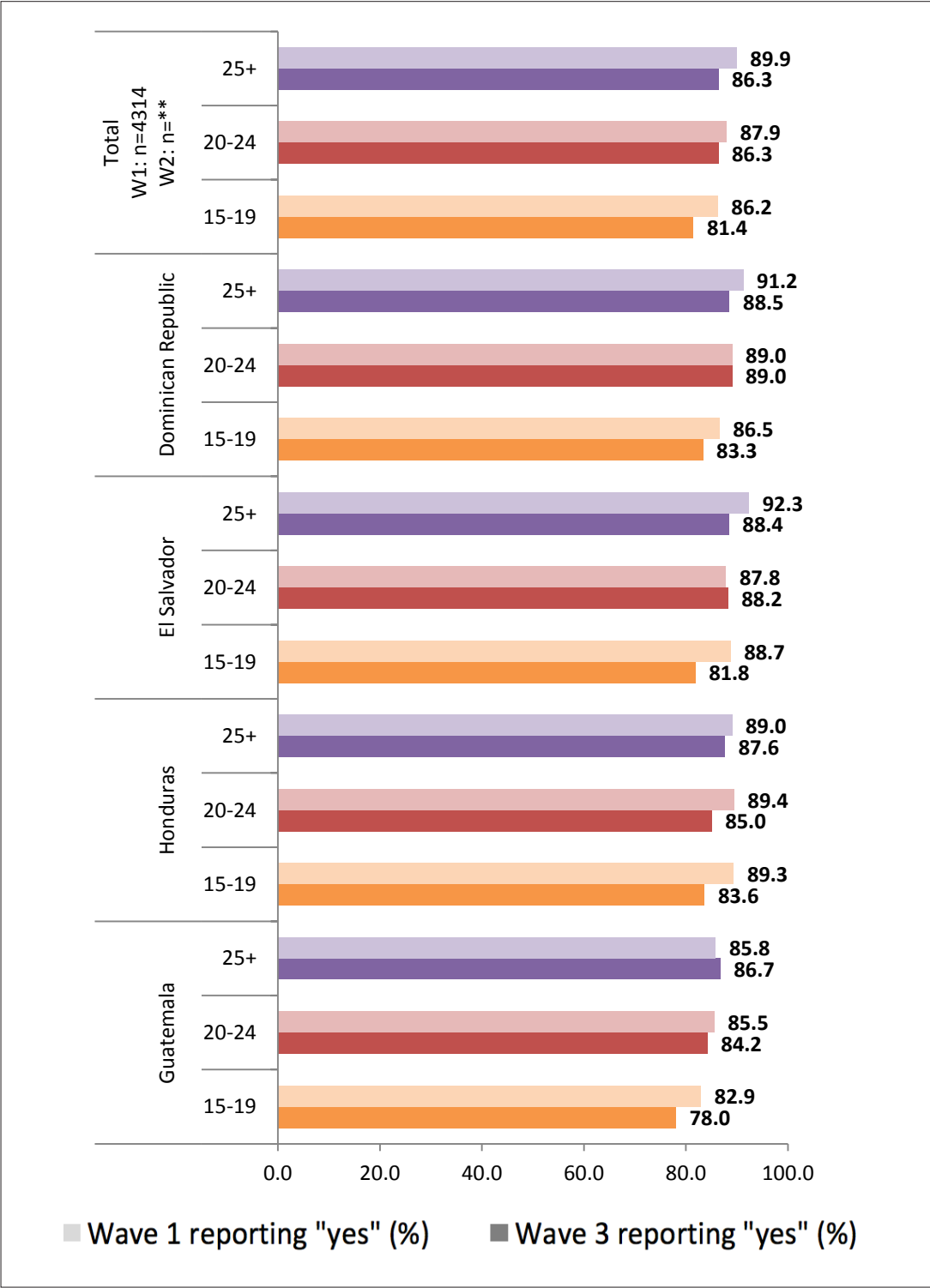
Similar trends were observed for participating pregnant women and partners of pregnant women, with the vast majority reportedly having eliminated standing water or scrubbed water containers to prevent Zika recently across all countries (>81%).

Figure 71. Percentage of participants who eliminated standing water or scrubbed water containers to prevent Zika in the last month (wave 2 vs. wave 3), by pregnancy/pregnant partner status



More youth and adults had, overall, had recently eliminated standing water or scrubbed water containers to prevent Zika when compared with adolescents.

Figure 72. Percentage of participants who eliminated standing water or scrubbed water containers to prevent Zika in the last month (wave 2 vs. wave 3), by age



DISCUSSION OF MONITORING RESULTS

Overall, increases in knowledge regarding transmission, symptoms and modes of prevention of Zika were observed between wave 1 and 3 of this monitoring survey. Notable increases were observed among pregnant women across countries. During the time period in between waves 1 and 3, a number of organizations, with significant support from USAID, have implemented communication activities in each country. These activities are being conducted over a range of platforms and channels, including a mass media campaign by PASMO/PSI and a host of community mobilization activities by partnerships representing organizations such as International Federation of the Red Cross, Save the Children, Medical Care Development International, Global Communities, and UNICEF, among others. It is possible that the observed increases in knowledge were influenced by these combined efforts. Finally, clinic-based counseling activities supported by the ASSIST project, International Federation of Planned Parenthood affiliates, and other organizations also may have played a role, particularly in the increases in estimates observed among pregnant women and men whose partners are pregnant.

Knowledge of Modes of Zika Transmission

- While a high proportion of all respondents (90.6% of females and 90.5% of males in wave 3) knew that Zika can be transmitted through mosquitoes, only approximately one-third of the overall sample (32.5% of females and 34.1% of males at wave 3) knew that Zika can be transmitted through sex. In addition, although not significantly different, the percentage of the overall sample of women and men reporting knowledge that a person can get Zika through sex was lower in wave 3 than in wave 1. A possible explanation for this finding could be differences in the underlying sample between wave 1 and wave 3.
- Awareness of sexual transmission is particularly important for pregnant women, who risk passing the virus to their babies. While pregnant women overall demonstrated an increase in knowledge of sexual transmission of Zika, country experience was varied. There were increases in this proportion between wave 1 and wave 3, but it is concerning that knowledge levels in Dominican Republic and Honduras decreased, and may reflect a decreasing emphasis on sexual transmission in programming in these countries.
- Generally there was poor knowledge of sexual transmission of Zika across countries, gender, and age groups, suggesting that knowledge of sexual transmission remains a critical information gap. While early Zika prevention efforts typically focused on vector control issues, there is a pressing need to encourage dialogue around sexual transmission of Zika. As this may be a sensitive topic, Zika programs should handle this messaging carefully. Partnerships with family planning and/or HIV units of the Ministry of Health may be useful to determine how to best position these messages. In some cases, these units may be able to incorporate Zika messaging into their programming – for example, encouraging condom use to prevent unintended pregnancy, HIV/STIs, and Zika virus.

Knowledge of Potential Outcomes of Zika

- Awareness of the potential outcomes of Zika were low across the wave 3 sample, with only 34.5% of females and 28.7% of males aware that a pregnant woman with Zika could have a miscarriage, 45.3% of females and 39.1% of males aware that a pregnant woman with Zika could have a baby with microcephaly, and 42.6% of females and 43.5% of males aware that a pregnant woman could have a baby with disabilities. The higher knowledge around microcephaly and disabilities compared with miscarriage associated with Zika suggests that these potential outcomes may be more visible or more easily discussed than miscarriage. Lower knowledge among men about these potential outcomes may reflect a lack of integration of men into these discussions.

- There were encouraging gains among pregnant women in all countries between wave 1 and wave 3 in knowledge of all three potential Zika infection outcomes; pregnant women are a key target audience for many ongoing Zika programs. Important increases are observed in the Dominican Republic, where UNICEF has carried out a number of activities to support babies born with disabilities related to Zika; lessons may be learned from this experience. Countries should continue to build on these gains, not only with pregnant women, but with all target audiences. Messaging strategies that focus on the importance of Zika prevention that appeal to emotions, with a call to action to protect the country's pregnant women and unborn babies may be particularly effective..

Knowledge of Asymptomatic Nature of Zika

- Less than one quarter of women (22.1%) and men (23.5%) in wave 3 reported that most people with Zika will not have any symptoms. This may reflect program focuses on symptoms that are easy to identify rather than on symptoms that cannot be observed and responded to. It may also reflect the challenges associated with developing program content around the lack, rather than the presence, of symptoms. The asymptomatic nature of the virus, combined with the fact that Zika can be sexually transmitted (another area in which knowledge remains low), could have negative effects on individual behavior. A pregnant women may not feel at risk when her partner does not show any symptoms of Zika. She could become infected with Zika virus, and then pass the virus onto her baby. For this reason, Zika programs should consider packaging prevention messages together in an integrated platform that takes advantages of opportunities to intervene with other programs. The connection between the asymptomatic nature of Zika and the fact that it can be sexually (and vertically) transmitted should be emphasized. Encouragingly, knowledge among pregnant women that most people with Zika will not have symptoms doubled between wave 1 and wave 3, from 16% to 32.3%. The difference was pronounced in every country.

Knowledge of Zika Prevention

- Proportions citing knowledge that mosquito repellent will reduce the risk of Zika was significantly higher in wave 3 than in wave 1, both for the overall sample and in each of the four countries, with overall country increases from 27.6%-53.7% in wave 1 to 52.7%-75.1% in wave 3. This represents important increases, and may reflect programmatic attention paid to this form of prevention. Knowledge of screens on windows and doors as a Zika prevention strategy also increased significantly between wave 1 and wave 3 in all countries, although this prevention strategy appears to be less well known (25.3% of females and 27.7% of males overall) than the use of repellent . In the Dominican Republic in particular, percentages with citing knowledge of this strategy doubled from wave 1 to wave 3. Nevertheless, there is room for improvement in both areas.
- The percentage of participants with knowledge that scrubbing water containers will reduce the risk of Zika decreased significantly across all countries from wave 1 to wave 3. Evidence of changes across all four countries suggests a system-wide issue that demands further investigation. While this difference could be due to seasonal changes that affect the prevalence of mosquitoes from wave 1 to wave 3, it may also be linked to changes, if any, in program content from wave 1 to wave 3. For instance, a program focus on novel or more nuanced forms of vector control, such as the expanding use of BTI larvicide, may reduce emphasis or divert attention from the more "basic" prevention method of scrubbing water containers.
- Knowledge that condoms will reduce the risk of Zika was low and this result was consistent with low knowledge of sexual transmission of Zika. However, across all countries, there were improvements in this knowledge from wave 1 to wave 3 and including among pregnant women, Nevertheless, overall only 16.1% of females and 16.8% of males knew that condoms were a Zika prevention strategy, and

the percentage of participants reporting knowledge of this prevention strategy remained lower than those for other strategies like mosquito repellent or using screens. The higher percentages with this knowledge observed in the Dominican Republic compared to other countries could be a reflection of reach and/or intensity of this message compared to other countries. In Guatemala, the percent with knowledge of condoms for Zika prevention increased from wave 1 to wave 3, and may reflect programmatic attention to this topic in this country.

- The belief that using a condom can prevent a pregnant person from getting Zika overall was higher in wave 3 (45.5% of females and 49.4% of males) than knowledge of condoms as a prevention strategy. While knowledge levels in this area increased slightly from wave 1 to wave 3, there were differences across countries, with Honduras showing clear decreases, Guatemala showing clear increases, and Dominican Republic and El Salvador demonstrating increases among females but decreases among males. Regardless, condoms as a Zika prevention strategy requires increased emphasis. Messaging in this area should go hand-in-hand with messaging around sexual transmission. It is possible that the increased knowledge of prevention behaviors observed by wave 3 may be evidence of greater perceived self-efficacy to protect themselves and prevent Zika, among women and men.

Zika Prevention Behaviors

- There were knowledge gains between wave 1 and wave 3 in most topics overall and in specific countries, however, more work is needed for this knowledge to translate into behavior change. Among both women and men, the percentage of participants that used a condom to prevent Zika increased slightly in wave 3 compared to wave 1, but this was not a significant difference. Other than in El Salvador, there were no significant positive differences in the use of condoms to prevent Zika. Condom use by pregnant women in El Salvador increased dramatically, from 41.4% in wave 1 to 61.9% in wave 3 and decreased considerably among pregnant women in the Dominican Republic (34.6% in wave 1 to 20.7% in wave 3). There may be lessons to be learned from El Salvador around condom use in the context of Zika programming.
- A higher percentage of men reported recently using a condom to prevent Zika compared to women. This gender difference may be due to under-reporting of condom use by women with perceptions that condoms are a male-focused intervention.
- There were no significant positive differences in the use of mosquito repellent to prevent Zika between wave 1 and wave 3, or in the elimination of standing water or scrubbing of water containers to prevent Zika between wave 2 and wave 3. While there was an increase in the percentage of participants with knowledge that mosquito repellent could reduce the risk of Zika, there were less obvious trends in reported use of mosquito repellent to prevent Zika in the last month (among pregnant women, use of repellent increased from wave 1 to wave 3 in Dominican Republic and El Salvador, but decreased in Honduras and Guatemala). This may be due to the lack of sufficient time for behavior change to occur, or may be due to differences in seasons (and accompanying risk perception) between when wave 1 and wave 3 were administered. In addition, it is possible that the cost and availability of mosquito repellent served as barriers to use.

The positive but non-significant changes are not unexpected, particularly given the short time period between wave 1 and 3 surveys. Because increases in knowledge typically precede changes in behavior, the increased knowledge observed in this monitoring survey is promising and should be capitalized on to continue momentum along the behavior change pathway. There is a need to further investigate the factors that affect whether and how knowledge related to Zika is translated into preventive actions.

LIMITATIONS

While SMS surveys are quick, cost and time effective, and generally have good penetration into target areas, there are some limitations to method that affect the interpretation of the results.

Limitations of the SMS survey method include:

- Selection bias – Only people who have mobile phones are accounted for in this sample. All types of mobile phone devices were viable for participation as the survey was not limited to smart phone users. Individuals without phones may be those who are marginalized and have greater needs for health information and services. This may imply that those who responded to and participated in the survey may differ on key demographic variables; for instance, they may have a higher socio-economic status or be more educated than those who did not respond, both of which influence knowledge and actions, and the sample may not be fully representative of the larger population in the target areas.
- Sampling bias – The characteristics of the mobile phone system in Latin America did not allow us to collect GPS coordinates cheaply, and these could not be accessed for the participants. While participants responded about where they slept the most in the last month, there may be an element of sampling bias in that individuals move about with their phones and those that received the invitation to participate may not be currently residing in the area within which the phone is registered.
- The two questionnaires were administered to different samples at slightly different times. Therefore, exploring associations between responses from the knowledge survey with responses from the self-actions survey is not entirely appropriate.
- The survey questionnaires had to be specially developed and formatted to work easily with non-android phones and the requirements of the SMS software. Questions developed for SMS have a character limit and typically are short with few response options and usually focus on key high impact topics rather than all possible enquiries. In addition, there is little space to provide explanatory detail, and participants cannot ask clarifying questions. While the survey was pretested several times, it is not possible to know if participants fully understood all the questions as intended.

RECOMMENDATIONS

SMS surveys were conducted to collect data about knowledge of Zika transmission and prevention, and behaviors to prevent Zika infection among individuals of reproductive age in Dominican Republic, El Salvador, Guatemala, and Honduras. Overall, all the countries demonstrated a need for programs that aim to increase knowledge about Zika transmission and risk, and effective ways to prevent infection. The results showed a need for intensified SBCC efforts about Zika in all countries, and especially among females (including pregnant women), adolescents and youth.

Specific areas for knowledge and information included the sexual route of transmission of Zika, the asymptomatic nature of the majority of Zika infections, consequences of infection, and effective ways to prevent Zika. Females and pregnant women appeared to have a greater need compared to males. However, there was much room for improvement in almost all of the estimates derived overall and for sub-groups regarding knowledge and reported prevention behaviors practiced in the last month.