


RESEARCH ARTICLE

Evaluation of Unintended Social and Economic Consequences of an Unplanned School Closure in Rural Illinois

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ABSTRACT

BACKGROUND: School closure is one of the primary measures considered during severe influenza pandemics and other emergencies. However, prolonged school closures may cause unintended adverse consequences to schools, students, and their families. A better understanding of these consequences will inform prepandemic planning, and help public health and education authorities in making informed decisions when considering school closures.

METHODS: We conducted a household survey and interviewed school officials following an 8-day long closure of a school district in rural Illinois. We described household responses regarding difficulties of school closure, and summarized main themes from school official interviews.

RESULTS: A total of 208 (27%) household surveys were completed and returned. This school closure caused difficulties to 36 (17%) households; uncertain duration of closure, childcare arrangements, and lost pay were the most often reported difficulties. Having 1 adult in the household losing pay and household income below \$25,000 were significantly associated with overall difficulty during this school closure. Concern about student health and safety was the most frequent theme in school administrator interviews.

CONCLUSIONS: Whereas the majority of responding households did not report difficulties during this school closure, households with 1 adult losing pay during the closure reported incurring additional expenses for childcare.

Keywords: school closures; communicable diseases; disaster preparedness; pandemic planning; public health.

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The US Centers for Disease Control and Prevention (CDC) recommends early coordinated school closures during a severe influenza pandemic as an effective measure to reduce or delay the spread of infection in communities before an appropriate vaccine becomes available.^{1,2} Unplanned school closures, especially those implemented for an extended period of time, can involve unintended social and economic adverse

consequences for school administrators, students, and student families.³⁻⁷ These consequences can disproportionately affect vulnerable populations and raise ethical concerns over school closures.⁸ Beyond interruptions to education, school-based services, such as school lunches subsidized through the National School Lunch Program, may also be affected by an unplanned school closure.⁹ A better understanding of challenges

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that student families face during school closures can help public health and education authorities inform planning and decision making for school closures during an influenza pandemic and other emergencies.

Beardstown Community Unit School District #15 (BCUSD) in Cass County, Illinois, was closed for 8 days from April 25 to May 6, 2013, to prepare for potential flooding. We conducted a household assessment to evaluate the social and economic consequences of this unplanned closure on schools, students, and their families.

METHODS

Participants

Beardstown, in central Illinois, has approximately 6000 residents. The majority (61%) of the population is white non-Hispanic, 33% are Hispanic, and 6% are black non-Hispanic. The median household income is \$35,469, and 26% of the population lives below the poverty level.¹⁰ A major employer in Beardstown is a large meatpacking plant, in which employees work in shifts (Personal communication with BCUSD superintendent). Twenty percent of Beardstown residents are immigrants from Latin America (89%), Africa (10%), and Europe (1%). Among the immigrant population, the primary languages spoken at home are Spanish and French.¹⁰

BCUSD is 1 of 3 school districts in Cass County and serves the population of Beardstown. During the 2012-2013 school year, the district enrolled 1534 students in 4 schools: 149 students in the prekindergarten school, 644 students in 2 elementary (grades K-5), and 741 students in the junior- and senior-high school (grades 6-12). About half (47%) of the students are white, 46% are Hispanic, 4% are black, and 3% are other races/ethnicities. The majority (72%) of students are eligible for the National School Lunch Program, which provides free or reduced-price lunches.¹⁰

Instrumentation and Procedure

We conducted a household survey and school administrator interviews in May 2013, 2 weeks after the school closure. A standard questionnaire was used for collecting data on childcare options, interruption of parental employment and income, disruption of subsidized school lunch program, parental perception of difficulties, and communication of information about the school closure. To accommodate the non-native English speakers, we translated the questionnaire into Spanish and French. All households having school-aged children enrolled in BCUSD were eligible to participate in the survey. We requested that only 1 questionnaire be completed per household, regardless of the number of children. Survey packets included a cover letter, questionnaire, and prepaid

envelope for returning completed surveys. The cover letter explained that respondents provide consent by completing and returning the questionnaire. At the elementary and junior- and senior-high schools, teachers distributed packets to students before school was dismissed for the day. At the prekindergarten school, administrative staff distributed packets to parents and guardians during child pickup hours. All completed questionnaires were returned to investigators by mail.

We used a semistructured interview form to obtain information on the perspectives of school administrators regarding the unplanned school closure. The interview consisted of open-ended questions about communication of school closure information, difficulties faced by schools, and how school-based services were handled during the school closure.

Data Analysis

We entered data from the household survey into a Microsoft Access database, and performed data management and analysis in SAS 9.3 (Cary, NC). We described demographic information of participating households, the types of difficulties caused by the school closure, and the communication channels used for announcing school closures through univariate analyses. We evaluated factors associated with reporting difficulties during the school closure, difficulties providing food after losing subsidized school lunches, and additional expenses incurred for childcare using univariate and multivariate logistic regression. Variables that were significant at alpha level of 0.10 in univariate analysis were included in multivariate logistic regression models. An alpha level of 0.05 was used to assess statistical significance in multivariate analysis.

We recorded school administrator interviews in Microsoft Word and calculated the frequencies of responses by topic.

RESULTS

Household Survey

Of the 1534 surveys distributed to the estimated 775 households, 208 (27%) were completed and returned, representing 423 students. The majority of respondents (106 [51%]) were white non-Hispanics, and 101 (49%) were high school graduates or had some college or technical school training. Annual household income was reported as below \$25,000 by 51 (24%) of households. Seventy (34%) households had 2 children between the ages of 0 and 17, and most households, 144 (69%), had 2 adults. The English version of the survey was completed and returned by 131 (63%) of households, the Spanish version by 61 (29%), and the French version by 16 (8%) (Table 1).

Table 1. Demographic Characteristics of Participating Households. Unplanned School Closure Survey. Beardstown, Illinois - May 2013 (N = 208)

Characteristics of Respondents and Households	N (%)
Race/ethnicity of primary responder	
White, non-Hispanic	106 (51)
Black, non-Hispanic	20 (10)
Hispanic	71 (34)
Other	5 (2)
Missing/refused to answer	6 (3)
Education of primary responder	
Grades 1-11	46 (22)
High school graduate	50 (24)
Some college or technical school training	51 (25)
College graduate	28 (13)
Graduate or professional school	12 (6)
Other	3 (1)
Missing/refused to answer	18 (9)
Language	
English	131 (63)
Spanish	61 (29)
French	16 (8)
Household income	
<\$25,000	51 (24)
\$25,000-\$49,999	66 (32)
≥\$50,000	58 (28)
Missing/refused to answer	33 (16)
Child enrolled in the free and reduced school meal program?	
Yes	142 (68)
No	53 (26)
Missing/refused to answer	13 (6)
Number of children per household	
1	73 (35)
2	70 (34)
≥3	61 (29)
Missing/refused to answer	4 (2)
Number of adults per household	
1	24 (11.5)
2	144 (69)
≥3	39 (19)
Missing/refused to answer	1 (0.5)

The school closure caused difficulties for 36 (17%) of the responding households. The most frequently reported difficulties were related to uncertainty about the duration of closure (23 [11%]), alternative childcare arrangements (21 [10%]), and lost pay during the closure (11 [5%]) (Table 2). Childcare provided by a nonworking adult that lives in the home was the most frequent childcare option, reported by 77 (37%) households. For 41 (20%) households, the caregiver was an adult living in the home and working outside the home (Table 2). In single-adult households, working adults missed work more frequently compared to 2-adult households where 1 adult or both adults work (53% vs 33% vs 35%) (Table 2). Of the households where a working adult provided childcare, the majority (30 [75%]) were 2-adult households; in most of these households (26

Table 2. Costs and Consequences of the Unplanned School Closure and Childcare Arrangements, Beardstown, Illinois—May 2013 (N = 208)

Household Responses	N (%)
Did family experience difficulty during the school closure?	
Yes	36 (17)
No	166 (80)
Missing/refused to answer	6 (3)
What made the situation difficult?*	
Didn't know how long school would be closed	23 (11)
Difficult to make childcare arrangements	21 (10)
Lost income due to missed work	11 (5)
Expensive to make childcare arrangements	9 (4)
Student missed school meals	5 (2)
Other	4 (2)
Did the school closure cause difficulty to provide food for the family because of the loss of meals provided by the free and reduced school meal program? (N = 142)	
Yes	21 (15)
No	121 (85)
Who cared for child while schools closed?*	
Adult who lives in home and doesn't work	77 (37)
Adult who lives in home and works outside home	41 (20)
Nobody, child old enough to care for him/herself	32 (15)
Other adult	30 (14)
Older sibling, 18 or younger	14 (7)
Adult who lives in home and works from home	11 (5)
Childcare program	6 (3)
Child home without supervision	3 (1)
Took child to work	2 (1)
Other†	25 (12)
School provided recommendations for alternative childcare arrangements	
Yes	11 (5)
No	182 (88)
Missing/refused to answer	15 (7)
Family incurred additional expenses for childcare arrangements	
Yes	44 (21)
No	158 (76)
Missing/refused to answer	6 (3)
Cost of additional expenses for childcare arrangements (N = 44) (median, range)	\$100 (\$30-1500)
Employment and income interruptions for selected family compositions	
Single-adult households, adult works outside the home (N = 17)	
Adult missed work	9 (53)
Adult lost pay	5 (29)
Two-adult households, only 1 adult works outside the home (N = 57)	
Adult missed work	19 (33)
Adult lost pay	12 (21)
Two-adult households, both adults work outside the home (N = 82)	
At least 1 adult missed work	29 (35)
At least 1 adult lost pay	13 (16)

*Categories are not mutually exclusive.

†Category includes different combinations of childcare arrangements listed above.

Table 3. Risk Factors Associated With Perceiving School Closures as Difficult, Beardstown, Illinois— May 2013

Variables	Reported Experiencing Difficulty Related to School Closure		Univariate Analysis		Multivariate Analysis [‡]	
	Yes (N = 36) N (%)	No (N = 166) N (%)	OR (95% CI)	p-Value*	aOR (95% CI)	p-Value
Number of adults in household						
≥2 Adults	30 (85.7)	148 (89.2)	1.0 reference		-	-
1 Adult	5 (14.3)	18 (10.8)	1.37 (0.47-3.98)	.562	-	-
Number of children in household						
1 Child	13 (36.1)	59 (36.0)	1.0 reference		-	-
≥2 Children	23 (63.9)	105 (64.0)	0.99 (0.47-2.11)	.988	-	-
Household income						
≥\$25 k	16 (55.2)	106 (74.7)	1.0 reference		1.0 reference	
<\$25 k	13 (44.8)	36 (25.4)	2.39 (1.05-5.45)	.038	4.12 (1.47-11.55)	.007
Language of survey respondents						
English	22 (61.1)	108 (65.1)	1.0 reference		-	-
Non-English	14 (38.9)	58 (34.9)	1.19 (0.56-2.49)	.654	-	-
Survey respondent race						
White NH	15 (46.9)	90 (55.9)	1.0 reference		-	-
Black NH & Hispanic	17 (53.1)	71 (44.1)	1.44 (0.67-3.07)	.351	-	-
At least 1 adult employed outside the home						
No	0	6 (3.7)	1.0 reference		-	-
Yes	34 (100.0)	156 (96.3)	NA	.593 [†]	-	-
At least 1 adult missed work						
No	16 (48.5)	100 (64.9)	1.0 reference		1.0 reference	
Yes	17 (51.5)	3 (5.1)	1.97 (0.92-4.20)	.080	0.63 (0.17-2.38)	.494
At least 1 adult lost pay						
No	14 (53.9)	85 (78.7)	1.0 reference		1.0 reference	
Yes	12 (46.2)	23 (21.3)	3.17 (1.29-7.78)	.012	3.61 (0.92-14.13)	.065

OR: odds ratio; aOR: adjusted odds ratio; CI: confidence interval; NH: Non-Hispanic.

*Wald chi-square test.

[†]Fisher's exact test.

[‡]Multivariate logistic regression (only variables significant at alpha = 0.1 in univariate analysis were included).

[87%]), both adults worked outside the home (data not shown). Eleven (5%) households responded that the schools provided recommendations for alternative childcare.

Household income below \$25,000 (adjusted odds ratio [aOR] = 4.12, 95% CI 1.47-11.55, p = .007) and having at least 1 adult in household losing pay during the closure (aOR = 3.61, 95% CI 0.92-14.13, p = .065) were significantly associated with reported difficulty during this school closure (Table 3).

Of the 142 (68%) respondents with children enrolled in the National School Lunch Program, only 21 (15%) responded that they had difficulty providing food for their family as a result of losing access to the program while the schools were closed (Table 2). Although more than half (11 [52%]) of these families had 3 or more children, the number of children did not contribute to the difficulty compared with households that did not report difficulty providing food. (Table 4).

Forty-four (21%) households reported incurring additional expenses for childcare arrangements during the school closure, with a median cost of \$100 (range: \$30-\$1500). Households with at least 1 adult losing pay during the school closure were more likely to report incurring additional expenses during the school

closure (aOR = 4.04, 95% CI 1.44-11.37, p = .008) (Table 5). There was no significant difference in lost pay and missed work between different family compositions and employment status of the adults (data not shown).

For this school closure, 179 (86%) of households reported receiving information about the school closure through an automated phone call from the school (Figure 1). Automated phone call was also reported as a preferred way to be notified during future closings or emergencies by the majority, 163 (79%) of respondents (Figure 2).

School Administrator Interviews

We interviewed 7 school administrators, including 1 superintendent, 2 school principals, and 2 vice principals about the school closure experience. Initial reactions about the school closure included concern about student health and safety, as reported by 4 (57%) administrators, and concerns about evacuation and storage of valuable equipment, as reported by 3 (43%) administrators. All administrators mentioned the usefulness of the automated phone call system to contact parents and guardians during this school closure; 5 (71%) said families used social media

Table 4. Risk Factors Associated With Difficulty Providing Food Because of Interruption of Subsidized School Meals Service, Beardstown, Illinois—May 2013

Variables	Reported Difficulty Providing Food to Family		Univariate Analysis		Multivariate Analysis [‡]	
	Yes (N = 21) N (%)	No (N = 121) N (%)	OR (95% CI)	p-Value*	aOR (95% CI)	p-Value
Number of adults in household						
≥2 Adults	15 (71.4)	107 (88.4)	1.0 reference		1.0 reference	
1 Adult	6 (28.6)	14 (11.6)	3.06 (1.02-9.17)	.046	1.90 (0.50-7.20)	.345
Number of children in household						
1 Child	4 (19.1)	40 (33.9)	1.0 reference		-	-
≥2 Children	17 (81.0)	78 (66.1)	2.18 (0.69-6.91)	.186	-	-
Household income						
≥\$25 k	10 (50.0)	64 (64.0)	1.0 reference		-	-
<\$25 k	10 (50.0)	36 (36.0)	1.78 (0.68-4.68)	.244	-	-
Language of survey respondents						
English	12 (57.1)	65 (53.7)	1.0 reference		-	-
Non-English	9 (42.9)	56 (46.3)	0.87 (0.34-2.22)	.771	-	-
Survey respondent race						
White NH	11 (52.4)	46 (40.4)	1.0 reference		-	-
Black NH & Hispanic	10 (47.6)	68 (59.7)	0.62 (0.24-1.57)	.308	-	-
At least 1 adult employed outside the home						
No	1 (5.3)	6 (5.0)	1.0 reference		-	-
Yes	18 (94.7)	114 (95.0)	0.95 (0.11-8.34)	1.000 [†]	-	-
At least 1 adult missed work						
No	7 (36.8)	77 (67.0)	1.0 reference		1.0 reference	
Yes	12 (63.2)	38 (33.0)	3.47 (1.27-9.54)	.016	1.11 (0.26-4.75)	.890
At least 1 adult lost pay						
No	8 (53.3)	60 (76.9)	1.0 reference		1.0 reference	
Yes	7 (46.7)	18 (23.1)	2.92 (0.93-9.15)	.066	2.61 (0.61-11.27)	.198

OR: odds ratio; aOR: adjusted odds ratio; CI: confidence interval; NH: Non-Hispanic.

*Wald chi-square test.

[†]Fisher's exact test.

[‡]Multivariate logistic regression (only variables significant at alpha = 0.1 in univariate analysis were included).

and 2 (29%) posted information on official school websites. In terms of communication with parents, guardians, and staff, 3 (43%) administrators said things went smoothly during this closure and they would not do anything different in the event of a future emergency. Suggestions for what can be done differently next time included using social media and mass e-mail to better communicate with parents prior to the closure regarding evacuation plans. When asked about the preplanning process to prepare for possibility of an unplanned school closure, 5 (71%) said there is a procedure in place for snow days and 3 (43%) mentioned a plan in place for weather-related emergencies and hazardous spills. Other issues of concern included making up instructional time that was lost during the closure (mentioned by 3 [43%]), and the logistics of moving and reorganizing equipment to avoid potential water damage (mentioned by 2 [29%]).

DISCUSSION

We evaluated the unintended social and economic consequences of an 8-day long unplanned school closure in Beardstown, Illinois. While the school

closure did not cause difficulty for the majority of respondents and their families, uncertainty about duration of the school closure, difficulty making childcare arrangements, missed work, and lost pay were mentioned as some of the main challenges of this school closure. The overall difficulties were more pronounced among households with annual income under \$25,000 and households with at least 1 adult losing pay during the closure. These findings are similar to previously described school closures implemented in other settings.^{3,5,11,12} Although not a problem for the majority of households, some households reported difficulty providing food to their family members as a result of losing subsidized meals during the school closure, similar to previous surveys.¹² We did not find a specific household characteristic that would be independently associated with difficulty providing food.

For the majority of households, at least 1 adult was available or made arrangements to stay home with their children during the school closure. In more than one third of households, childcare was provided by a household adult not working, suggesting availability of a nonworking parent or an extended family member, similar to what was observed in

Table 5. Risk Factors Associated With Incurring Additional Expenses, Beardstown, Illinois— May 2013

Variables	Incurred Additional Expenses		Univariate Analysis		Multivariate Analysis [‡]	
	Yes (N = 44) N (%)	No (N = 158) N (%)	OR (95% CI)	p-Value*	aOR (95% CI)	p-Value
Number of adults in household						
≥ 2 Adults	35 (81.4)	142 (89.9)	1.0 reference		-	-
1 Adult	8 (18.6)	16 (10.1)	2.03 (0.80-5.12)	.134	-	-
Number of children in household						
1 Child	11 (25.0)	62 (39.7)	1.0 reference		1.0 reference	
≥ 2 Children	33 (75.0)	94 (60.3)	1.98 (0.93-4.21)	.076	2.16 (0.80-5.81)	.127
Household income						
≥ \$25 k	24 (64.9)	97 (72.4)	1.0 reference		-	-
< \$25 k	13 (35.1)	37 (27.6)	1.42 (0.66-3.08)	.374	-	-
Language of survey respondents						
English	27 (61.4)	104 (65.8)	1.0 reference		-	-
Non-English	17 (38.6)	54 (34.2)	1.21 (0.61-2.42)	.584	-	-
Survey respondent race						
White NH	20 (48.8)	86 (56.6)	1.0 reference		-	-
Black NH & Hispanic	21 (51.2)	66 (43.4)	1.37 (0.69-2.73)	.374	-	-
At least 1 adult employed outside the home						
No	0	6 (3.9)	1.0 reference		-	-
Yes	41 (100.0)	149 (96.1)	NA	.347 [†]	-	-
At least 1 adult missed work						
No	17 (40.5)	100 (68.5)	1.0 reference		1.0 reference	
Yes	25 (59.5)	46 (31.5)	3.20 (1.58-6.49)	.001	1.79 (0.64-5.02)	.271
At least 1 adult lost pay						
No	16 (47.1)	84 (83.2)	1.0 reference		1.0 reference	
Yes	18 (52.9)	17 (16.8)	5.56 (2.37-13.03)	<.0001	4.04 (1.44-11.37)	.008

OR: odds ratio; aOR: adjusted odds ratio; CI: confidence interval; NH: Non-Hispanic; NA: Not applicable.

*Wald chi-square test.

[†]Fisher's exact test.

[‡]Multivariate logistic regression (only variables significant at alpha = 0.1 in univariate analysis were included).

southeastern Kentucky.¹³ Although for 1 of 5 families a working adult stayed home with children, it did not contribute to employment and income interruptions during this school closure. For longer school closures that may be implemented during influenza pandemics, however, this arrangement may prompt issues of job security. Of the families reporting difficulty during the closure, 10% specifically cited difficulties in making alternative childcare arrangements.

In the CDC and Harvard survey, 20% of respondents reported missing work during H1N1 school closures.¹¹ In a study by Johnson et al on school closures in North Carolina after an influenza B outbreak, 24% of employed adults reported missing more than 1 day of work.⁶ In Borse et al's study conducted in New York City during the 2009 H1N1 pandemic, at least 1 adult missed work in 17% of households during school closures.¹² In our study, the proportion of households that missed work and lost pay is slightly higher than the findings from previous studies, especially among single-adult households in which the adult works outside the home. However, the proportions of employed adults also varied from study to study and cannot be compared.

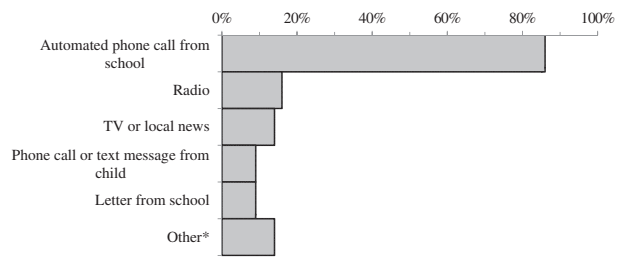
Both household survey respondents and administrators reported that the automated phone calls were

useful for communicating information during this school closure, highlighting the effectiveness and timeliness of this system. The majority of respondents noted that this phone call system is a preferred way to be contacted in case of future emergencies. A major strength of the automated phone call system in Beardstown is that the messages were recorded in English, French, and Spanish. This ensured that language was not a barrier when communicating school closure information in a timely manner.

Limitations

Our findings are subject to several limitations. Since the survey was distributed to all households in the school district and responses were voluntary, we cannot account for households that chose not to participate in the survey. However, the distribution of demographic characteristics of survey respondents compared to the Beardstown population is very similar in race and ethnicity, suggesting that the survey respondents may be representative of Beardstown population, and that the findings are generalizable to this community. Because the survey was distributed toward the end of the school year, it may have contributed to the lower response rate and small sample size; however, this response rate is comparable

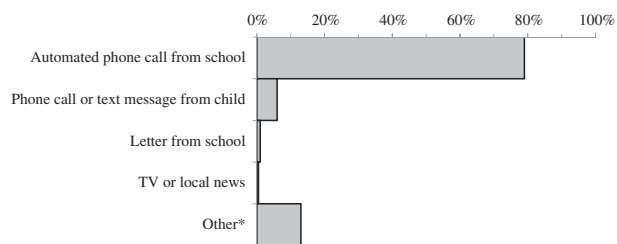
Figure 1. Communication Methods During School Closure in Beardstown, Illinois—May 2013



Note. categories are not mutually exclusive.

*Category includes different combinations of ≥ 2 categories listed above

Figure 2. Preferred Communication Methods for Future School Closings or Emergencies



*Category includes different combinations of ≥ 2 categories listed above

to that in similar surveys.^{11,12} We were unable to assess whether the immigrant population was accurately represented in our sample, as some immigrants may have chosen to fill out the questionnaire in English. The percentage of households in our survey in which English is a second language was 37%, slightly higher than the general population of Beardstown, which suggests that this segment of the population was adequately represented in our study.

Conclusions

Our investigation showed that although the unplanned school closure did not cause difficulties for the majority of the survey respondents, the closure could be challenging for families with at least 1 adult losing pay during the closure and for low-income families. Families where at least 1 adult loses pay may also be more likely to incur additional expenses for childcare. Parental job security should be discussed as a potential difficulty during school closures. Our study also highlighted the usefulness of an automated phone call system, potentially useful for school districts without an effective communication method in place.

IMPLICATIONS FOR SCHOOL HEALTH

To prepare for unforeseen school closings in the future, school contingency plans should account for the potential unintended consequences for student families. The findings of our survey suggest that although short-term unplanned school closures do not cause major social and economic disruptions for students and their families, several factors should be considered while planning for emergency school closures. Making alternative childcare arrangements can be challenging for families, particularly among households in which all adults are employed outside of home. Specific recommendations for childcare options available in the area may help these families avoid employment and income interruptions. Arrangement of prepared or prepackaged meals for children enrolled in the National School Lunch Program may help families provide food to their children during school closures, which can be especially critical during prolonged closures. Timely conveyance of school closure information via automated calls can help families plan for school closure-related contingencies and avoid unnecessary disruptions.

Human Subjects Approval Statement

The Institutional Review Board at the Illinois Department of Public Health (review number 0858) determined that this survey was exempt from full review.

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